POWER COSTS

Are they stacked against profits?

In your search for more profitable tonnage, wouldn't it be a good business move to find out whether 12%* of your manufacturing costs couldn't be cut in half? • This may be brought about by improving your lubrication practices through the use of more suitable lubricants and more efficient methods of application. • Texaco *tested* Lubricants have established a reputation for cutting power costs. Texaco's technical experts have aided many mills through their knowledge of paper mill lubrication problems and intelligent cooperation with both managements and operating staffs. • It doesn't cost anything to see whether Texaco can benefit you as it has benefitted others. Write for a representative to call.

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PAPER INDUSTRY

MARCH, 1935
Vol. XVI—No. 12

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of the Pulp and Paper Industry

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May have their differences of opinion regarding many things - - -
BUT, one thing they agree on, ALWAYS: They check and double-check in their liking for TENAX FELTS. They KNOW them to be *"Dependable Under All Conditions"*; that they Speed Production UP and Keep Costs DOWN.

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helps win boat races . . . in your paper mill
it saves money and maintains
paper quality

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Correct weight distribution is as important in your mill as in a speed boat. Improper weights at your pressrolls are a source of constant expense. Uneven and incorrect weight adjustment is costly in its effects on paper quality, felts and pressrolls. Only maintenance of correct pressroll pressures at both ends of the press can eliminate trouble and unnecessary costs. The Taylor Pressroll Load Recorder was developed to help you do this —and keep an accurate, hour-by-hour chart record of pressures at both ends of the press.

This Taylor Recorder has proved that it can:

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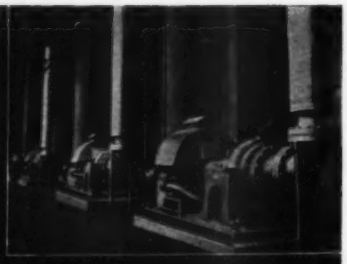
TEMPERATURE, PRESSURE *and* **FLOW INSTRUMENTS**

Through a Modern Paper Mill with Allis-Chalmers . . .

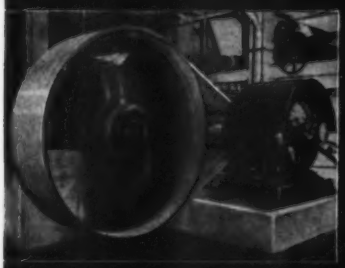
12"x10" SSOR Stock Pumps handling stock from blow pits to storage chests.



8" x 6" SSA Acid Circulating Pumps handling sulphite cooking acid.

450 hp Synchronous Motors driving Jordans in Southern Paper Mill.

Standard Squirrel Cage; Enclosed Fan-cooled Type Motors.



150 hp Allis-Chalmers Motor and Texrope Drive operating beater.

Allis-Chalmers Motors and Texrope Drives operating stock screens.

Allis-Chalmers Automatic Extraction Steam Turbine Unit in a Paper Mill.

Allis-Chalmers Rod Mills preparing pulp stock in Southern Paper Mill.

Pumps Type SSOR pumps were especially designed for pumping paper stock. Because of their sturdy, balanced construction and high efficiency, they have lowered pumping costs. Other Allis-Chalmers paper mill pumps include the Type SSA for handling digester acids, Type S for general water supply, Type SSU close-coupled motor-pump units and Type M multi-stage pumps.

Motors Allis-Chalmers builds motors for every type of paper mill drive above 1 hp. This includes not only standard induction, synchronous and direct current motors, but motors with electrical and mechanical modifications to suit the drive, such as fan-cooled, splash-proof and drip-proof types. The larger motors include those for operating grinders and direct current paper machine drives.

Drives Texrope Drives are used in every part of the paper and pulp mill, operating beaters, rod mills, screens, jordans, calenders, pumps, chippers, barkers, and other machines. Texropes are the ideal paper mill drives as they are unaffected by moisture; starting and acceleration are smooth; and they require no belt dressing, greasing or oiling. Texrope Drives help maintain steady production through steady performance.

Other Machinery Allis-Chalmers also builds other machinery for paper mills such as rod mills for the preparation of pulp, Thorne barkers, perforated metal, vibrating screens for wood chips, rotary lime kilns, and rotary compressors and vacuum pumps. Power plant equipment includes steam and hydraulic turbines, condensers, generators, switchboards, generator voltage regulators, and auxiliaries.

ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A. —

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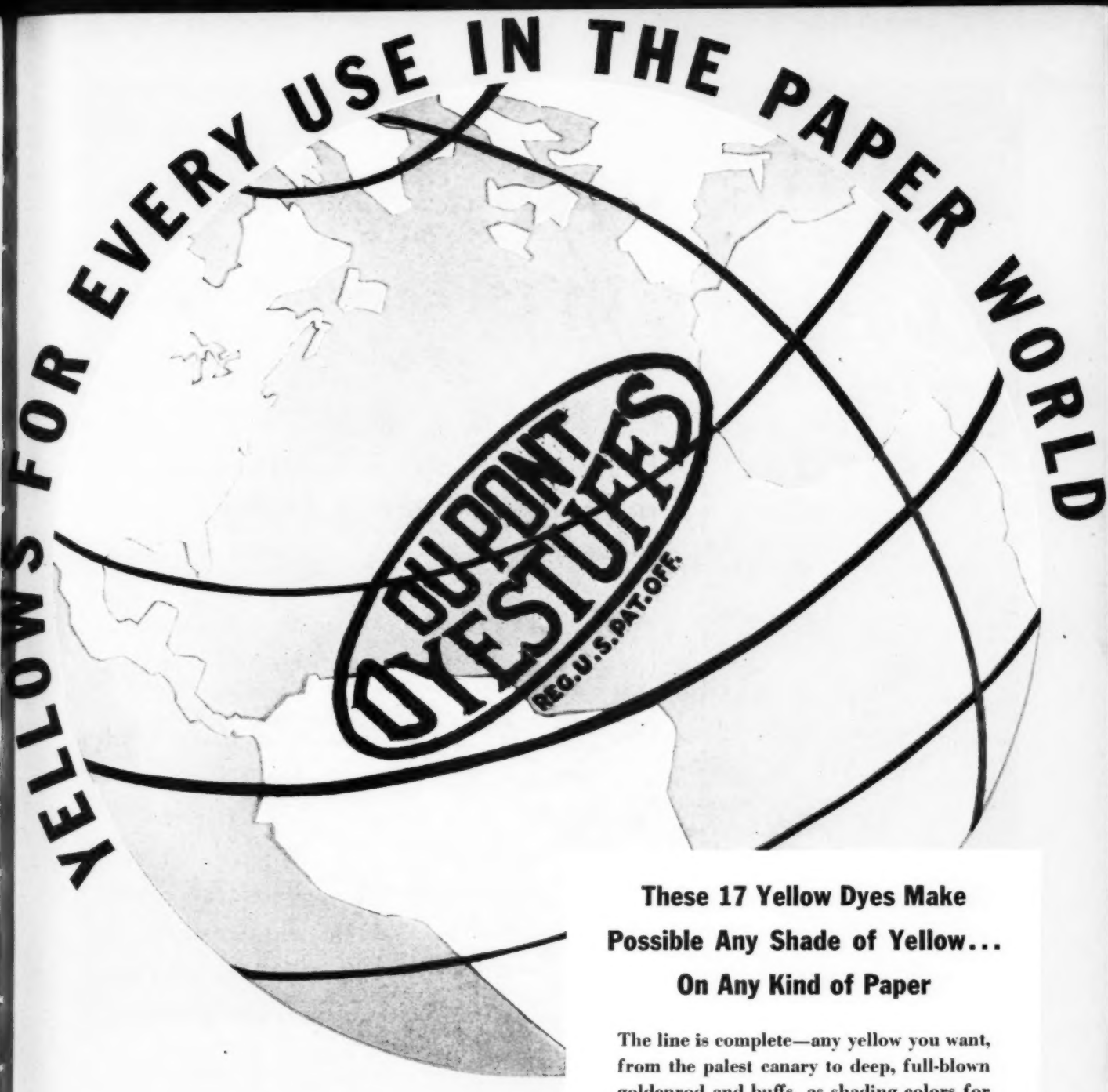

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The line is complete—any yellow you want, from the palest canary to deep, full-blown goldenrod and buffs, as shading colors for browns, greens and greys. Dyes for any type of paper—bond, cover, wrapping, manila or ledger. For any method of dyeing—beater, calender or dipping. They'll meet any requirements of fastness to light, alkalies, acids or chlorine. Our technical staff will gladly recommend the type of dye best suited to your requirements. There's a du Pont paper dye for every purpose.

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Appleton Felts

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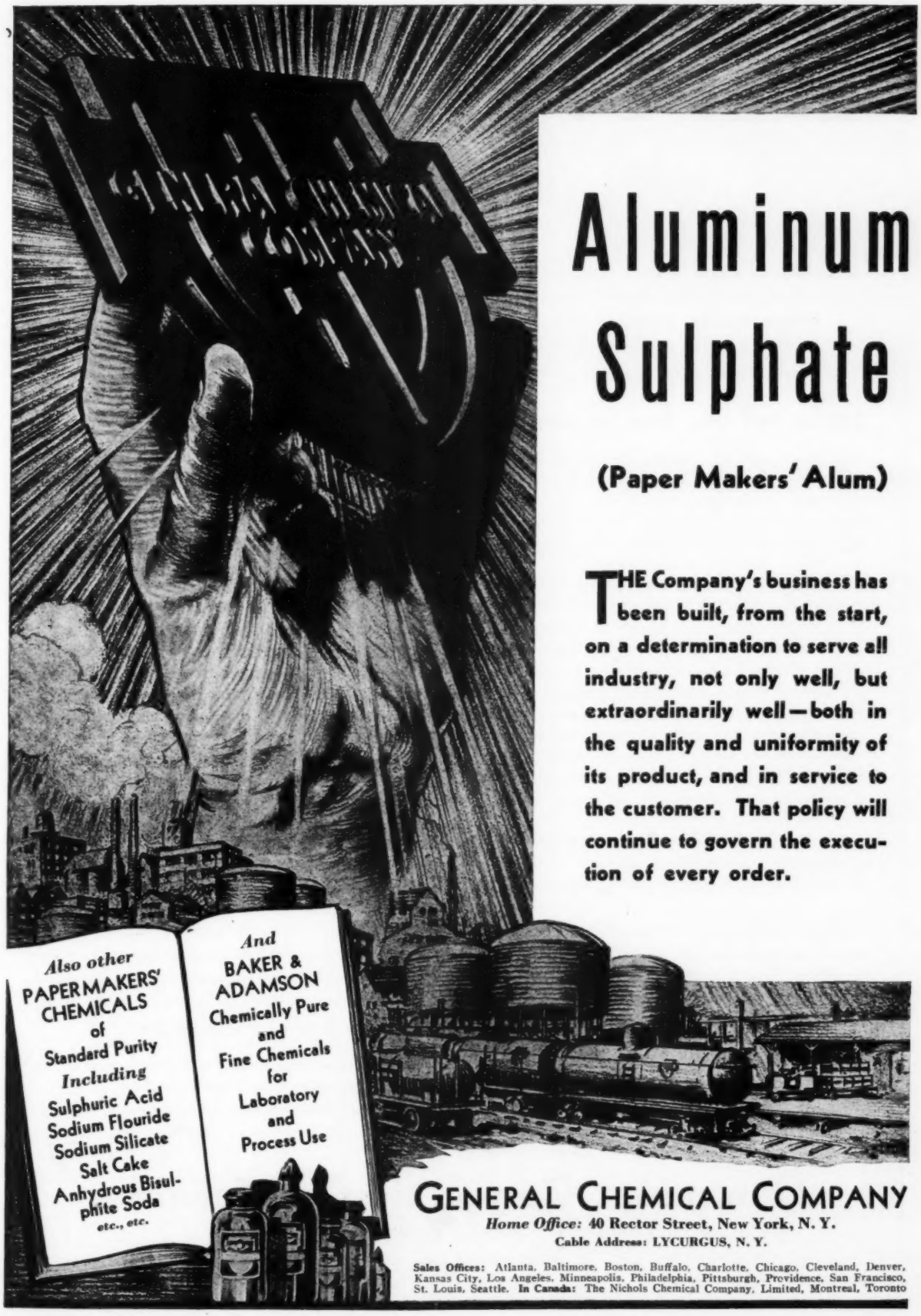

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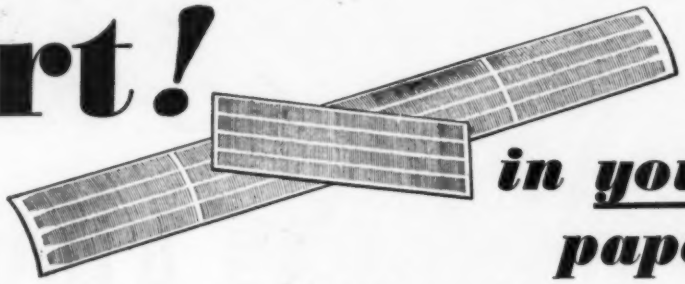
Dirt! in your paper?



Clean paper can be made only with the essential aid of the most efficient screening operations. Too wide slots, forced velocity, partially clogged screens and short useful screen plate life . . . . these are productive of low quality, high cost and dissatisfaction.

CRODON
The Chrome Plate

Let us tell you how to cure these ills with chromium plate . . . . . .

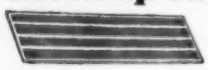
Worn, rough and inaccurate slots result from normal wear of ordinary plates. CRODON provides a permanently hard, durable protection against corrosion. Fine precision of slot dimensions is accurately maintained.

Fine slot sizes are possible with CRODON: not only is cleaner, finer paper obtained, but it is unnecessary, in order to maintain full production, to force velocity and increase dirt count. Scientific co-ordination of slot sizes can be arranged and kept permanent, thus introducing long fibres minus dirt. The added slot smoothness more easily passes screened stock without slowing up production. Clogging (which often reduces capacity 50% or more) is practically eliminated.

CRODON-plated screen plates attain long useful life. The unduly prolonged use of inefficient screens is no concern of mills which have installed chromium-plated plates—they're making cleaner and better paper at lower screening costs than ever before.

The realization of worth-while economies, establishment of new and enviable performance records and trouble-free operation materializes with the aid of CRODON. These attainments have been proved by practical experience of regular paper-making operations. CRODON-plated screens offer outstanding improvements over ordinary plates, whether flat or curved types.

Check up on your screening operations . . .



Let us send you our Bulletin No. 9 to more fully acquaint you with CRODON-plated screen plates.

Other outstanding successful applications in the paper industry are on press rolls, suction box covers, drying drums and embossing rolls. These and other specific applications are fully described in bulletins which will be furnished upon request.

The trade-mark CRODON assures the best in chromium plate

Most mills appreciate the importance of utilizing a reputable chromium plating service such as CRODON typifies, and which is recognized as a standard specification for the maximum in quality: dependability with resultant cost reductions, and improved operating efficiency.

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National Industrial Recovery

IT is now two years since the Roosevelt Administration came into power at Washington, and promptly instituted the New Deal operations. These two years have been momentous in the history of industry in this country. In June, 1932, congress epitomized the New Deal operations in what is known as the National Industrial Recovery Act, which purposed to take active charge of all industrial operations in this country.

In spite of a national determination to end the depression through the medium of the National Industrial Recovery Act, the plan has not worked as successfully as its authors and proponents claimed it would, nor has it been as remedial as the rank and file of voters and workers were led to expect. However, it must be admitted that substantial, solid gains have been made.

We are now at the end of the first two years of New Deal operations and stand at the crossroads of the endeavor to bring industry back to its former healthy functional basis. The question now uppermost in the minds of all thinking men is: "Where do we go from here?"

That we will consolidate all the gain of the past two years and push forward to future success is as certain as the fact that day follows night.

The past two years have been costly, but the ultimate benefit to be derived therefrom will, in our opinion, justify such cost.

During these past years, under code requirements, industrial leaders and workers have gathered weekly and monthly in experience and educational meetings. Reliable statistics giving true pictures of industrial conditions have been made and placed in the hands of all industrial operators and workers and furnished the public. Industry knows today the reason for its failures and perceives the course it must pursue in order to cure its ills and safeguard its future health. Industry knows today where it is going and how to get there.

Political panaceas and theories, artificial stimulations, and financial shots in the arm, all have been given ample trial and proved ineffective. The only reason industry has survived these many experimentations is because it has a good constitution.

The swing from now on will be back to compliance with fundamental law and particularly the law of *demand* and *supply*.

The law of demand and supply is basic, constant, and immutable. It bids all operators in its economic realm to seek first the demand for commodities and then provide for the supply; not to create huge supplies and then try to locate a demand.

Industry has learned its lesson. Industry from now on will adjust all its operations strictly in accordance with the market demand for its products. For instance, if the consumers of paper in this country demand from the mills 25,000 tons a week and send in bona fide orders for the same, the mills will produce 25,000 tons—no more. This is not only good common sense but the highest type of modern scientific merchandising, which results in stable markets, confident operations, insurance of activity, and steady employment.

National industrial recovery is certainly on the way to complete fulfillment. Of course, it will have its ups and downs while the great industrial giant is undergoing the necessary adjustment treatments, but the ultimate return of national industry to sound, healthy, normal operations is today definitely in sight.

+ EDITORIAL +

KEEPING POSTED

TWO decades ago, the sulphate pulp and paper industry of the United States was an infant industry struggling for a foothold. The sulphite and groundwood industries, although well established, were operated for the most part by rule of thumb methods. Paper machines were comparatively narrow and operating speeds on some grades at least were comparatively slow.

Then came an awakening. The market was in need of paper, and with this need came an unprecedented expansion in the productive capacity of the industry. New machines were developed to perform individual process operations more efficiently. Paper machine speeds on newsprint and other grades were stepped up to speeds which only a few years previous would have been believed impossible of accomplishment. Designers of paper machines also continued to increase machine widths until a 304-inch machine was built and placed into successful operation. Now a machine of even greater width is in process of construction or has actually been built, and one can hardly help but wonder if wider and faster machines are yet to come.

Likewise, new uses for paper were developed, and paper is being used today for purposes which, if such uses had been suggested twenty years ago would probably have been considered the ideas of impractical dreamers if nothing worse.

No small part of this entire development has been due to the activities of the technical man—the engineer, the chemist, the technologist—who has worked side by side with the production forces for the benefit of the whole.

Just twenty years ago, on April 6, 1915, and again on May 6, 1915, a small group of such men met in Chicago for the purpose of drawing up articles of organization for an association, which had really been instituted the previous February at the annual meeting of the American Paper and Pulp Association. This newly organized body was destined for a time to be known as the Technical Section of the American Paper and Pulp Association. Whether these men envisaged the important developments which in less than a quarter of a century have come to pass is not known. Nevertheless, it is known that they were interested in keeping posted with the technical developments of the day, and in giving of their experience to others in so far as they were able.

At first, the membership in the association was limited to such qualified men who were associated with mills that were members of the American Paper and Pulp Association. This limitation was soon found undesirable and necessary changes were made in the constitution of the association to include men qualified to join whether or not their company was a member of the American Paper and Pulp Association.

This change in the constitution was made at the time of the first fall meeting of the association which was held on September 23, 1916, in New York City. The name of the association was changed to that of the Technical Association of the Pulp and Paper Industry at what has since become known as the first annual meeting, held February 16, 17, 1916, in New York City. Under this name, the association has continued to serve the industry for the past twenty years. Its membership has increased from 207, the number of recorded members at the time of the first annual meeting, to 1127 members as of December 31, 1934.

The scope of the association has broadened with each passing year. Its membership has done much to stimulate research and to disseminate the findings. The trade literature of the papermaking industry throughout the world has profited by these valuable contributions and the entire industry in turn has benefited by having the published material readily available.

These activities no doubt have removed cobwebs from the minds of some and have kept many from getting into a rut.

The recent annual meeting, the twentieth annual convention of the association, which was held February 18-21, 1935, at the Waldorf-Astoria Hotel in New York City, is demonstrative of the desire on the part of technical men to work together for the good of the industry that is giving them their livelihood. Approximately 500 delegates registered at this meeting. These delegates represented mills and allied organizations from all parts of the United States, as well as Canada and several European countries.

These delegates, it is believed, came with the desire to renew acquaintances, to talk over mutual problems with one another, and to glean something from the various papers and discussions that might prove of practical benefit to them in their work. In other words, they had a desire for keeping posted. If such was their purpose in attending, there was ample opportunity for individual fulfillment and T.A.P.P.I. is to be congratulated for making such an assembly possible.

This issue of "The Paper Industry" contains a digest of practically all of the papers presented before the various sessions of this annual convention of the association so that our readers may obtain quickly a broad concept of the subject material discussed.

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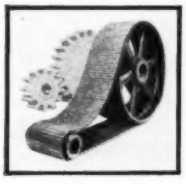

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TO which should be added the important item of long life—years of uninterrupted service, at the same high efficiency as when the drive was first installed.

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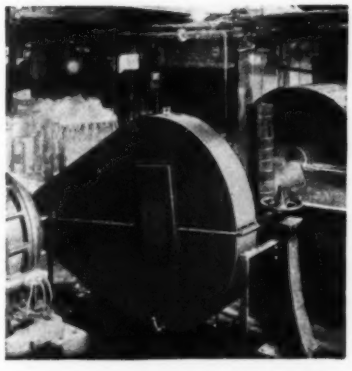

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Making Archaeology Easy

By WILLIAM SIBLEY

IN a recent issue of the *American Weekly* there appeared a picture of the cross-section of a tree. The tree was formerly a member of the giant redwood family of the Pacific Coast; a tree which presented itself as a magnificent specimen of that most famous of all trees; a tree which represented a remarkable example of longevity of life. Across the face of this picture there had been placed a number of arrows, each pointing out a particular tree-ring, and indicating the tree's growth, comparative size at certain periods, and its final age.

By counting the rings within this tree the detectives of botanical science knew that the tree began growing in the year 550. Twenty years later, when the tree was yet quite small, Mohammed was born. Two hundred and fifty years later, when the tree had grown to stalwart manhood, we find the arrow indicating that at this time Charlemagne was crowned. Still farther from the center other arrows indicated rings and specified that here the Magna Charta was signed; here, Joan of Arc was burned; here, America was discovered; here the Pilgrims landed; here, the Revolutionary War was fought; here, the Civil War, etc.

As I looked at the cross-section of that fallen giant I couldn't help ruminating over the fact that here had been an immense quantity of pulp for paper, standing unused for a thousand years, while all humans were limiting their writing and recording to the costly, bulky and heavy parchments.

Prior to about 190 B. C., when Eumenes II of Pergamum invented parchment (using one encyclopedia as my authority) such records as remain are only those which were engraved on stone, with the result that we can but sketchily divine the events and habits of early mankind. Save for a few carvings and engravings we can know but little that is accurate of the peoples who lived prior to the second century Before Christ.

And even for the ensuing fifteen centuries, only a very limited history is available, because records were restricted to the preciously rare parchments. As we know, the choicest of parchments were made from the skin of the still-born Hibernian lamb. And so precious were they that monks used them over and over again, erasing the almost indelible script with pumice stone, that the surface might carry more recent, and seemingly more important, writings.

Because of this scarcity of record material, what countless historical facts and what numberless gems of thought must have been forever lost to posterity. Beautiful thoughts regarding the Supreme Architect have failed of perpetuation because of the absence of paper. Lovely melodies inspired by the pebble-bedded brook or the chord-like rumble of the seashell have never been passed down to us because of the lack of means for their recording. Historical events of such deep-going importance as to affect subsequent racial characteristics are but little remembered and quite misunderstood because of the lack of paper.

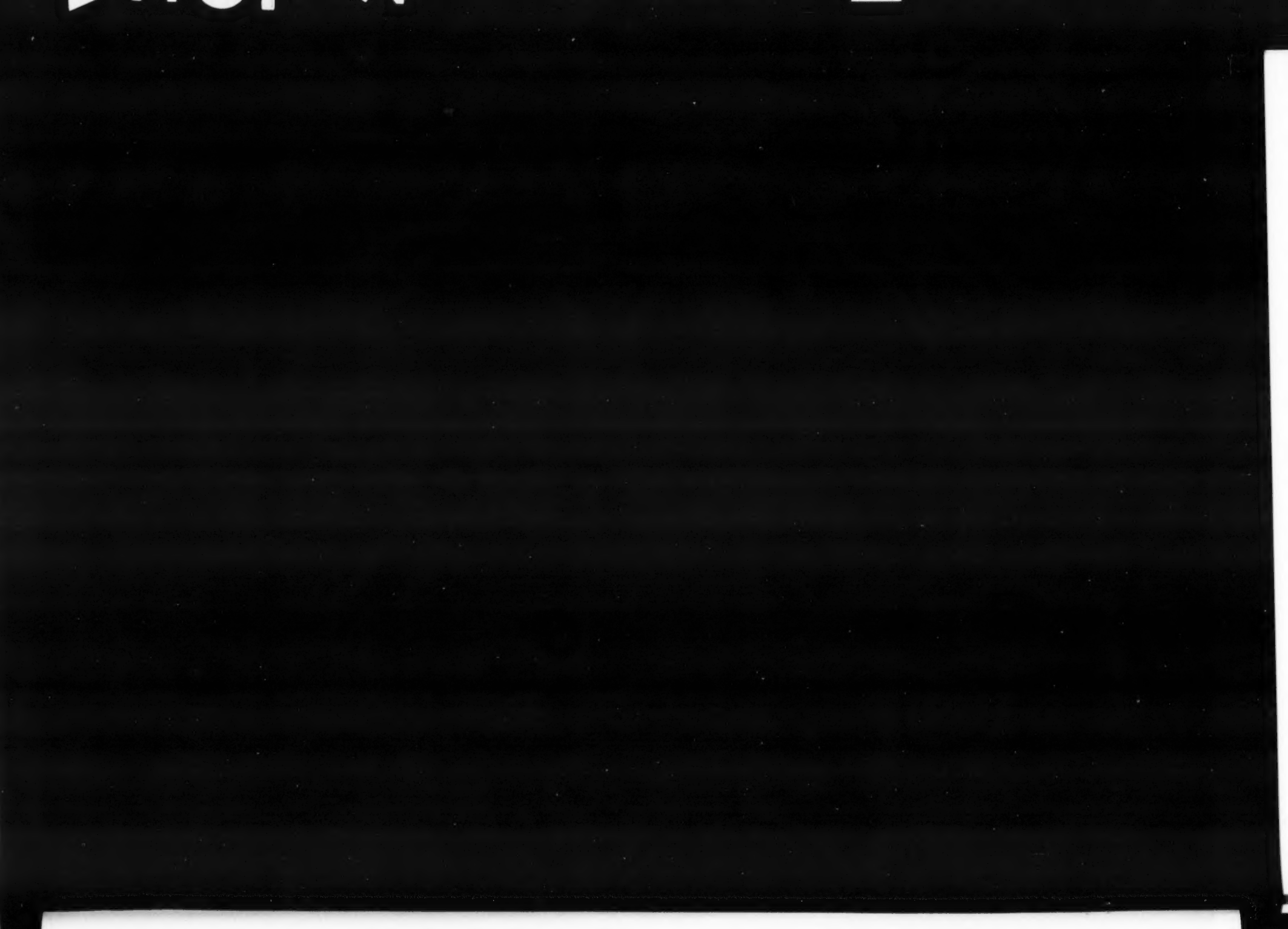
Now we realize that the darkness of those ages might have been illuminated for all if man had known how to cut down trees, reduce them to pulp, then cook and convert that pulp into paper. Man's ingenuity for the multiplying of records asserted itself only about the fourteenth century. Only as recently as the militant Luther was type for the printing of paper invented.

Since then—since the advent of paper and its printing—few worthy thoughts, few important deeds, few melodic tone poems have gone unrecorded. Since the advent of paper we know what was said, what was thought, what happened, and who did it. Now, with paper, we faithfully reproduce and disseminate for the good of all, the pictured impressions of the colorful Rubens, the meticulous Hals, the brutally frank Van Eyck, the prolific Van Dyck, the subtle Rembrandt, the vivid Van Gogh, the versatile da Vinci, the complimentary Holbein, the descriptive Valesquez.

With paper we hold in permanent form the rumblings of Bacon and Handel, the mutterings of Schopenhauer and Liszt, the thunderings of Savanorola and Wagner, the description of Hugo and MacDowell, the shrieking of Neitsche and Carpenter, the beauty of Browning and Beethoven, the depth of Pope and Bach.

Having paper we now and then take bits of it and imprint upon it something that is powerful enough to echo through the Halls of the League; influence the chancellories of the world; make strong men weep and impel mothers eagerly to send their sons to war. With paper we leave behind records for the interesting study of archaeologists yet to come. Our paper of today might very conceivably stand us in good stead ten, twenty or fifty thousand years from now. Our paper will abolish all necessity for archaeological guesswork. When ten thousand years hence, they excavate the metropolis of New York, or dig out of the debris of ages the buried city of Chicago, they will have merely to decipher our system of hieroglyphics to know exactly what sort of people we were—what we thought—what we did.

In my hundredth reincarnation I hope to bend my steps in the direction of archaeology. And at that time I hope I may have gained sufficient ability to pay a fitting tribute to paper.



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Aqua Ammonia	Caustic Soda	Silicate of Soda
Barium Carbonate	C. P. Ammonium Hydroxide	Soda Ash
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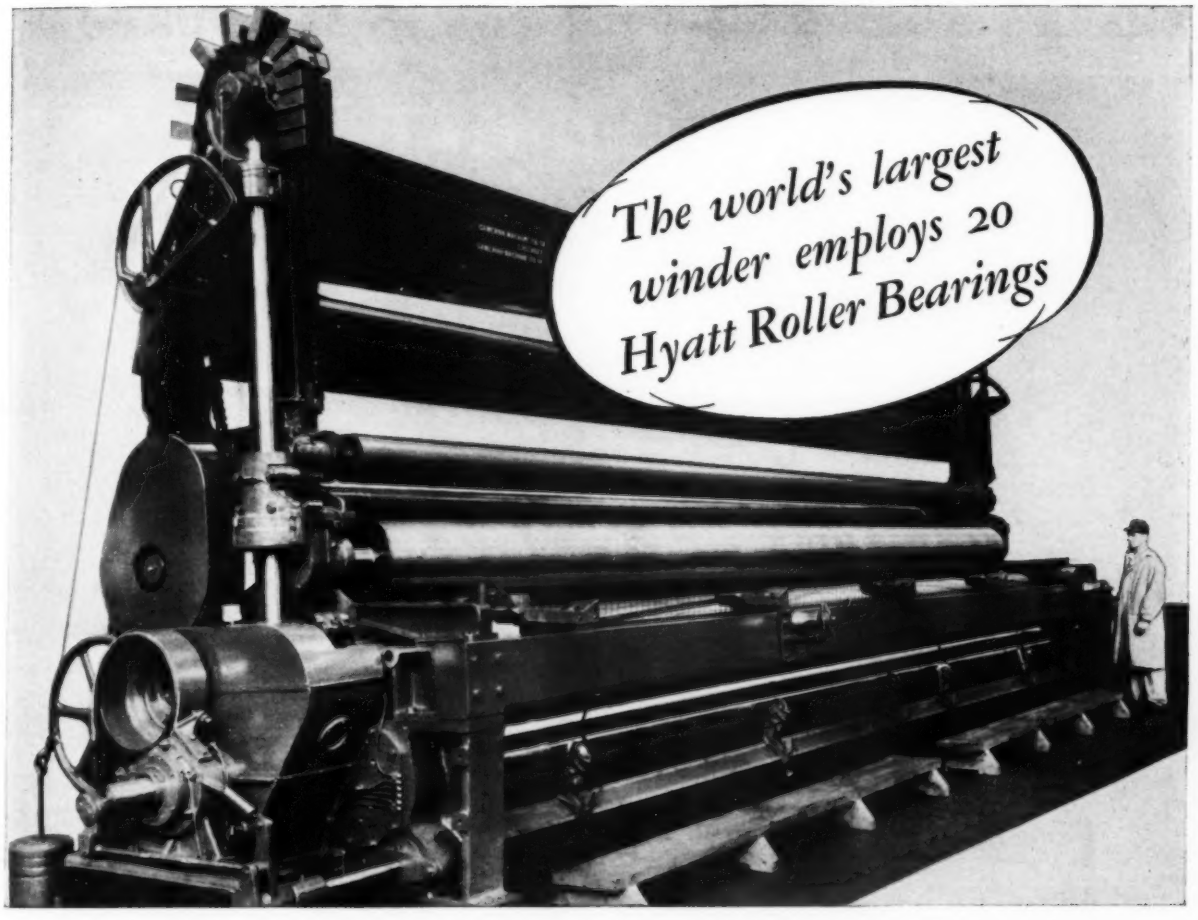

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All we can add is that Cameron Machine Company have used Hyatt Roller Bearings for a number of years in similar applications on their many winders in domestic use. They know how well Hyatt Roller Bearings function and had no hesitancy in Hyatt-equipping this machine for overseas use.

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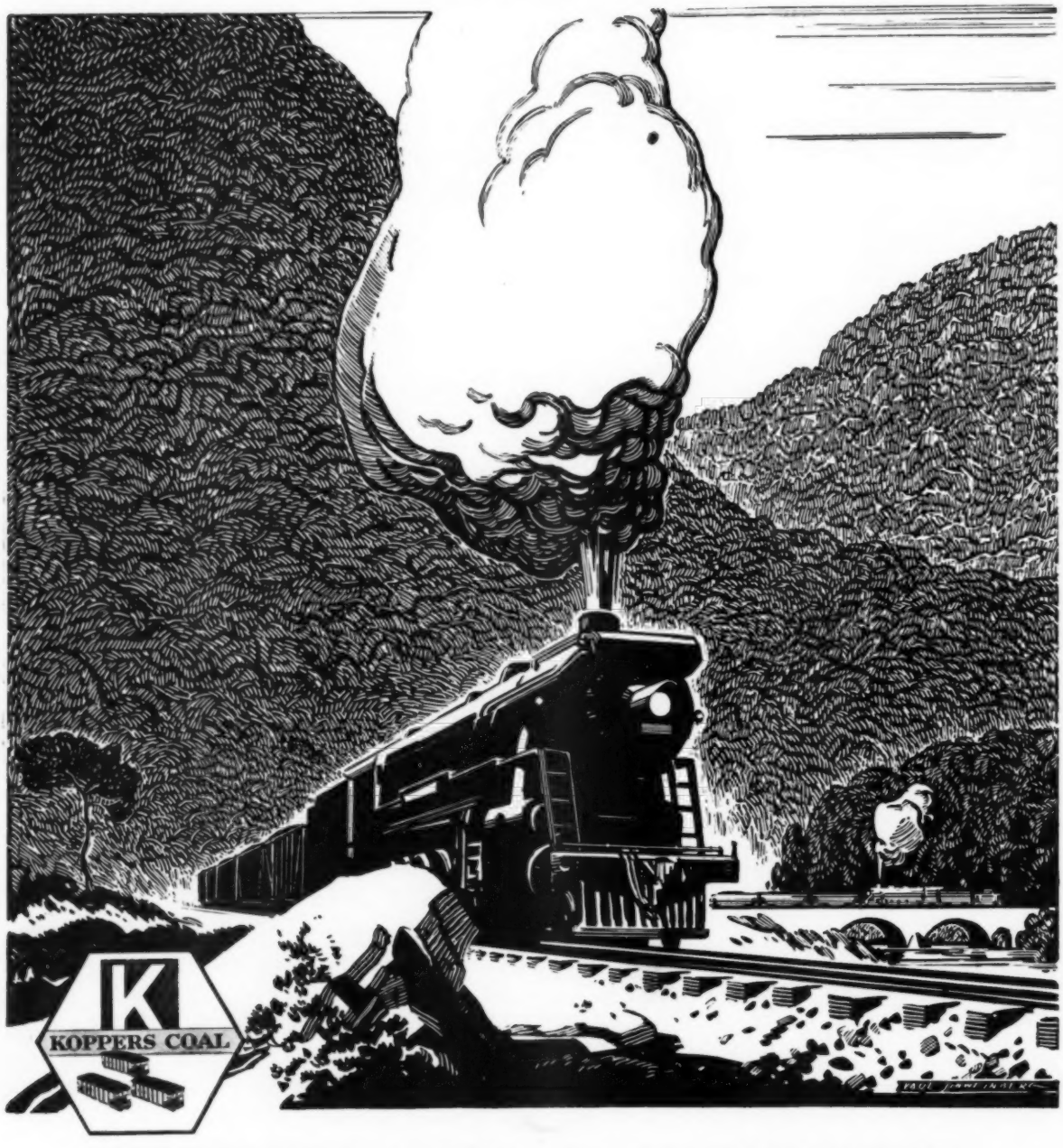

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The Gates Vulco-Rope Drive is the *only* V-belt built with the patented concave side.

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Fig. 1. *Straight-Sided Belt*

Fig. 2. *Belt with Patented* CONCAVE *Side*

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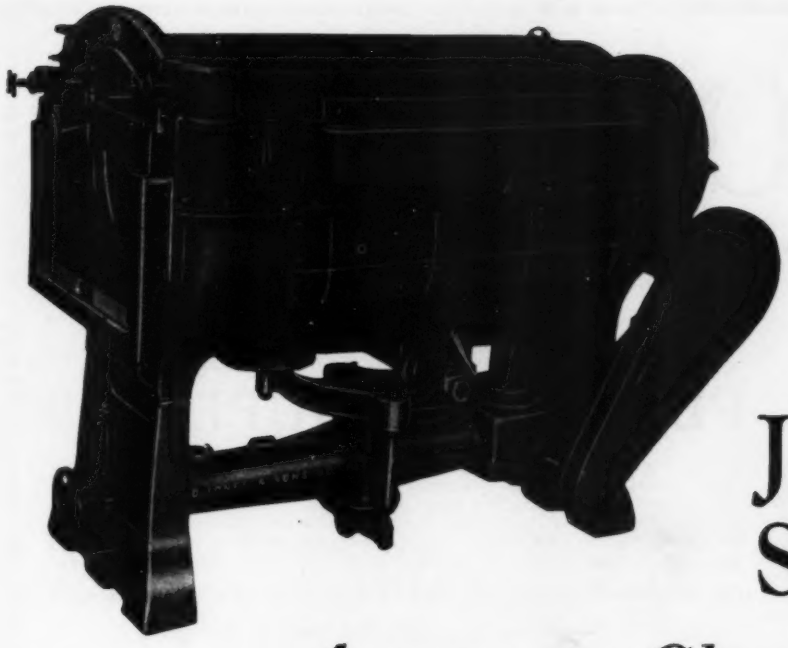

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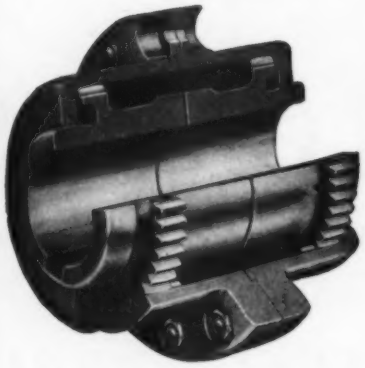

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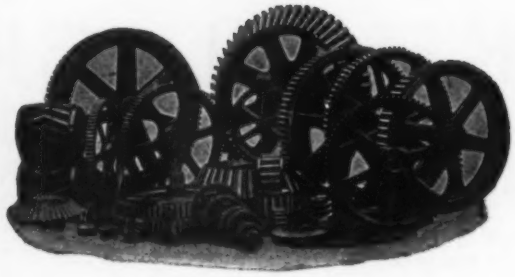

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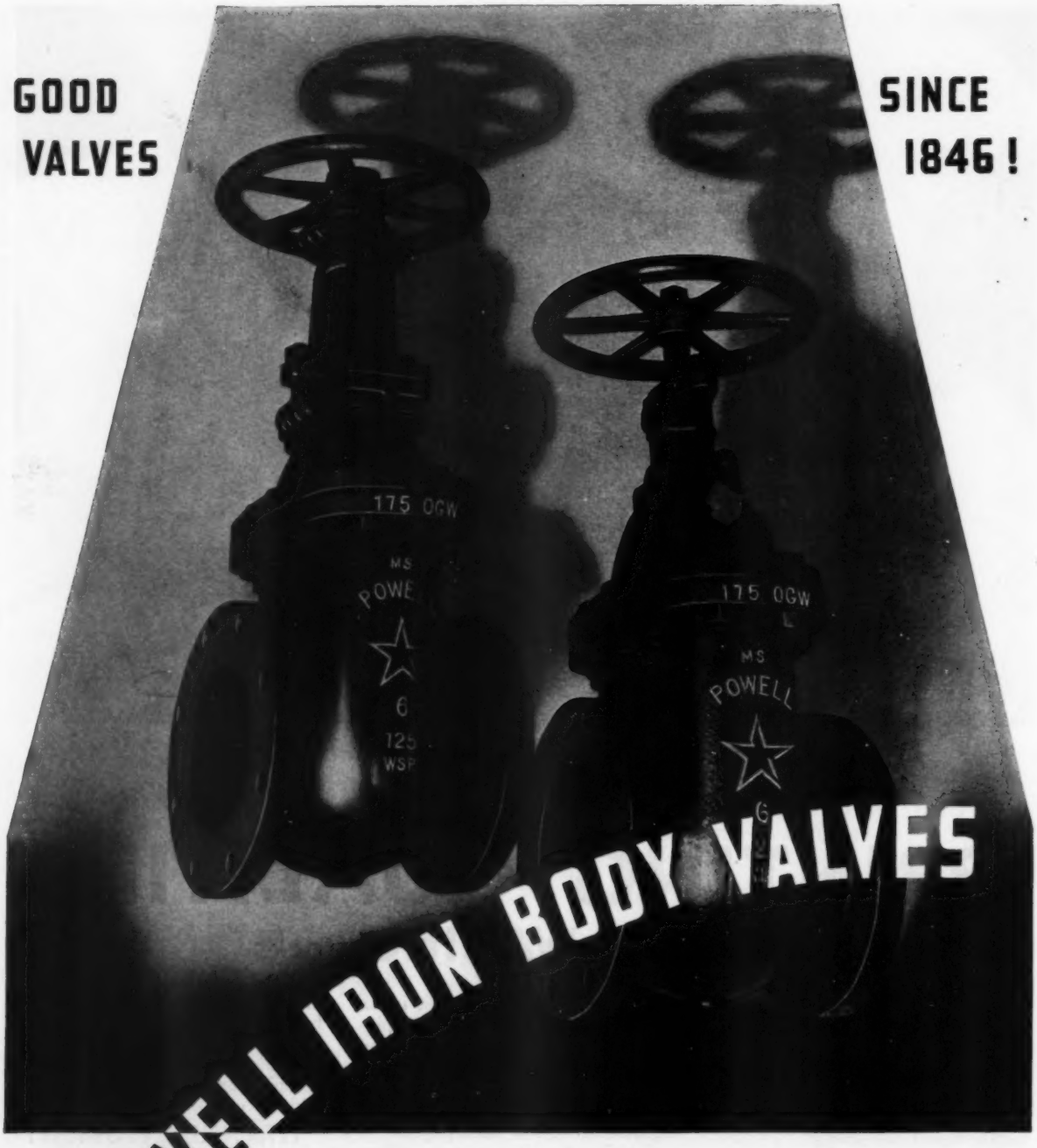

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In S & W Undercuts alone, the knife works from below—with the cutting edge always up. If the knife should drop, the cutting edge *falls away* from the danger point. Gravity—not man-made devices alone—is the positive insurance against injury.

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DUAL CONTROL—both hands below table at time of the cut.

POSITIVE DRIVE *(not a friction drive)*—automatic pressure clamp prevents slipping.

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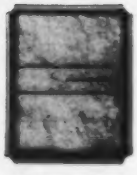

Hamilton Felts are marked by two blue lines full width of felt and by one blue line midway between them.

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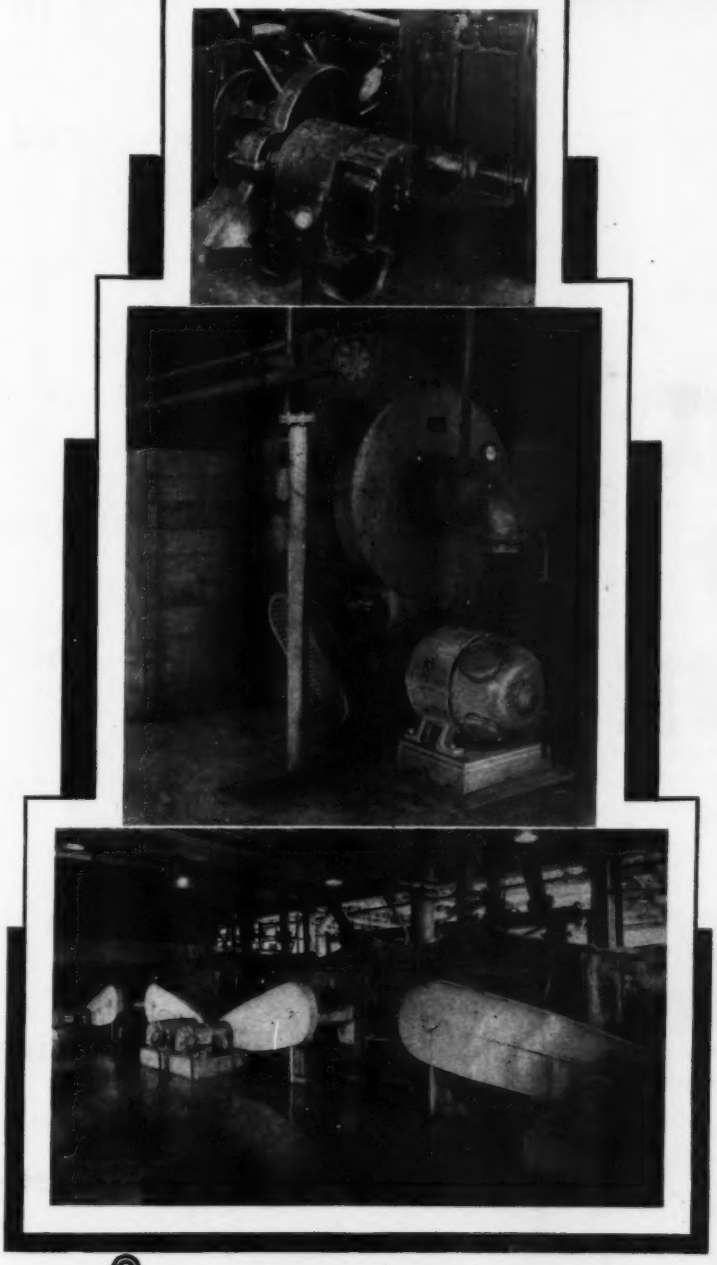
Paper mill Motors that DON'T MIND the WATER



■ The hose is a common sight around a paper mill. It is used throughout the mill for washing down machines and cleaning up floors. Motors are not spared from the stream of water in this daily practice. To protect motor windings from this water, use fully-enclosed water-tight, enclosed fan-cooled, or splash-proof motors depending on the amount of water present. Shake drives, filters and pulp deckers are only a few of the many applications where these types of motors may be profitably used.

■ Reliance Motors for paper mills withstand water regardless of source—the hose, the machine, or the surrounding atmosphere. The mechanical construction precludes the contact of splashing water with the motor windings. Special water-proof insulation gives added strength to the windings themselves to resist moisture. Paper mills everywhere have long found it profitable to use Reliance motors, for they don't mind the water.

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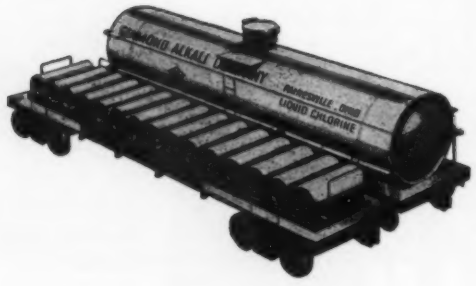

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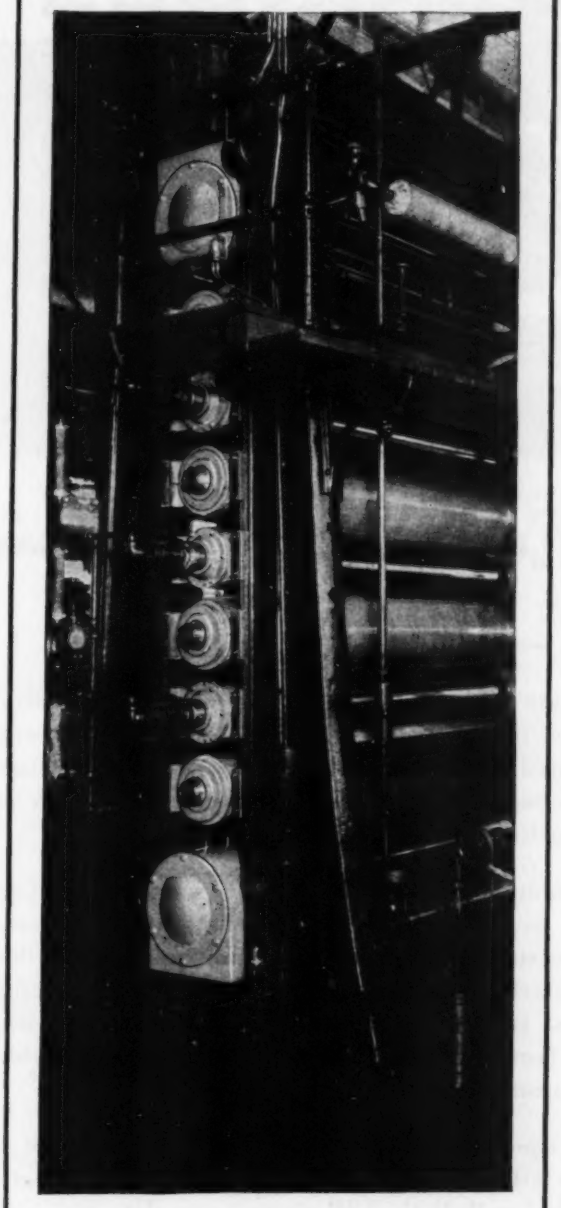

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Dodge-Timken Supercalender Bearing advantages are profit opportunities. There are ten big ones, many less important. (1) Savings in power up to 50% have been made. (2) Production has been increased 37½%. (3) No leakage of lubricant to cut down usable roll width. (4) No waste in starting because weights need not be raised. (5) No sudden starting shock to cause journal breakage. (6) No cooling water required. (7) Overloading of motors is avoided. (8) Alignment of rolls is permanently maintained. (9) Frequent regrinding of rolls is eliminated. (10) Installation will pay for itself in from 1½ to 3 years.

With Dodge-Timken Bearings on your supercalenders you will produce more finished stock per hour at lower cost per pound. You will eliminate repair delays, excessive lubrication and motor maintenance costs.

The experience of leading mills, plus the reputation of Dodge for quality products and sound engineering, is your assurance of complete satisfaction.

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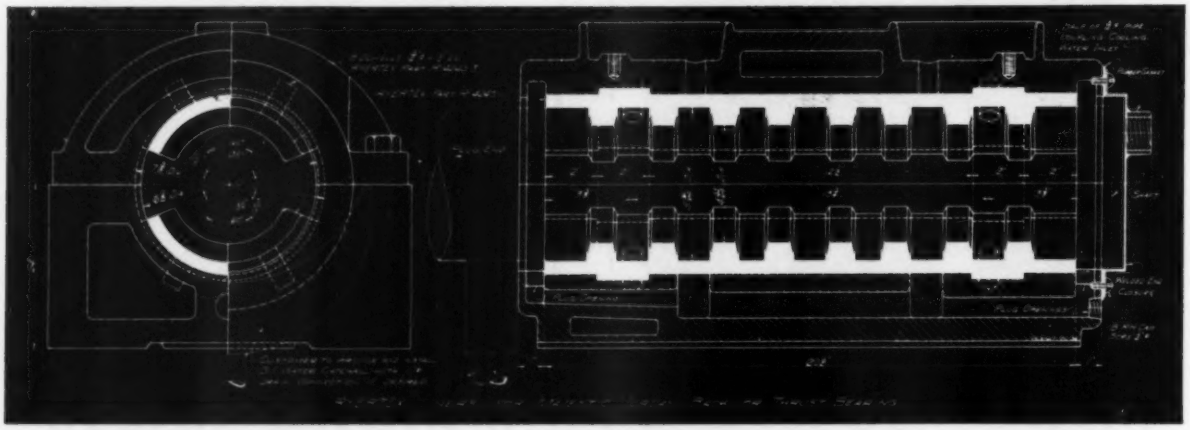

Ryertex Jordan Bearings allow maximum plug pressures, reduce power consumption, together with greatly increased bearing life.

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THE PAPER INDUSTRY
A MONTHLY EDUCATIONAL JOURNAL

BEARING FUNDAMENTALS

O. K. GRAEF, Mechanical Engineer

THE modern theories of the action of lubricants in bearings have been meeting the test of time, and it is not the purpose of this paper to attempt to go beyond those generally accepted theories. It is the intention, however, to attempt to clarify some of the popular misconceptions of the mechanical and hydraulic actions that occur in bearings.

The principal components of a journal bearing are the shaft, the bearing and the lubricant. The lubricant may be defined as any fluid which has the capacity of wetting the shaft and the bearing, such as oil or water, but not mercury.

The performance of the whole may be affected to a certain degree by various characteristics of each of the members. That is, the diameter of the journal, the material of which it is made, its smoothness, its straightness (deflection) and its speed of rotation, all bear in varying degrees upon the successful operation of the whole. In the bearing, we have to consider the length, the diameter, the material and the smoothness of the surface. The chemical composition of the lubricant; i.e., oil, grease, water, etc., and its viscosity have certain effects. For the whole assembly, the difference between shaft and bearing diameters, or clearance, the method of applying the lubricant, oil bath, drip feed, or wick feed, etc., and the load applied to the bearing are very important factors.

When a body of weight, W, is caused to move at a uniform speed on a smooth horizontal surface by a force P, the ratio P/W is termed the coefficient of static friction. If now we have a journal rotating in a bearing, we have a special case of friction. Here we may take the load on the bearing as W and the tangential force at the surface of the journal as F, then the coefficient of friction for the journal will be F/W and may be designated by f. $f = F/W$

Thurston, in his *Friction and Lost Work*, has shown that the relation between the coefficient of static friction C and the coefficient of journal friction f in tight fitting journals is:

$$f = 1.27 \text{ to } 1.57\ C$$

In loose fitting journals, that is in journals where the shaft and the bearing are tangent at a point, the relation is:

$$f = \frac{C}{\sqrt{1 + C^2}}$$

This very aptly demonstrates the effect of clearance upon friction losses.

Friction in bearings is commonly ascribed to the mutual interference of minute irregularities on the surfaces. The common assumption is that these microscopic irregularities interfere with each other and thus cause frictional losses. Experimentally, however, it has been shown that when these irregularities have been polished to almost absolute flatness, the friction is still great enough to cause rapid erosion of the surfaces. For this reason, the modern theory concludes that friction is due to an interaction, but not an interference, between the surface roughnesses, and that this interaction is due to an interlocking of the electromagnetic fields of force which radiate from the interfaces of the particles which go to make up the bearing and the journal. Therefore the best method of reducing friction is to reduce the electromagnetic effect of the particle interfaces, and that is the function of the lubricant which is applied between the rubbing surfaces. This theory is supported to a certain extent by the fact that the addition of 1 per cent to 2 per cent of stearic or oleic acid to the oil will reduce the frictional coefficient to a greater extent than is explainable on any other grounds.

Assuming a journal which carries a 180-degree bear-

ing upon its upper side and a load applied to the bearing (the lower side of the bearing being so arranged that it revolves in a bath of lubricant) it can be demonstrated experimentally that the rotation of the journal will lift the lubricant from the bath and tend to force it between the journal and the bearing surface. This phenomenon is explained by calling attention to the effects of molecular attraction between the metal of journal and the lubricant, assisted by the viscosity of the lubricant and the adhesive force between the lubricant and the metal.

If no load is applied to the bearing, and assuming the bearing to be without weight, a relatively thick film of the lubricant will carry uniformly in thickness around the journal, floating the weightless bearing half upon the top surface of the adsorbed lubricant film, without decreasing the film thickness. If, now, a load is applied on the bearing, the lubricant will be squeezed out from under the bearing laterally, and the thickness of the film will be reduced until the total pressure in the film of lubricant balances the load applied to the bearing. Thus as the bearing load is increased, the film thickness will become less and less until finally the bearing is forced against the journal and metal to metal contact results.

If the loaded bearing rests upon a stationary journal, the film of lubricant will be squeezed from under the bearing and the bearing will rest upon the metal of the journal; thus no film is present to separate the surfaces, and when rotation is started a very high friction loss results. This fact accounts for the very high starting torque required to start a journal carrying a loaded bearing from rest and bring it up to its normal rotational speed. But as the journal begins to rotate, it will carry a film up into the bearing and will tend to build up the film pressure until it is equal to the load, and the bearing will be forced away from the journal until equilibrium is established between the load and the film pressure. The load is then transmitted through the lubricant film without any metal to metal contact.

A factor of great importance in any discussion of the mechanics of lubrication, is the fact that the shaft rarely rotates truly, but is usually slightly eccentric due to the deflection caused by the load. This produces a condition which makes a simple exposition of lubrication quite difficult. For the purpose of this discussion, therefore, the effect of eccentricity, due to shaft deflection, will be neglected, but it should be understood that in the design of a bearing the shaft deflection never should be neglected as it has the effect of reducing the clearance along the length of the bearing and this results in local overheating, leading finally to premature destruction of the bearing and / or journal.

There are three types of friction which may occur in a bearing. Where a journal rotates in a dry, unlubricated bearing, friction between the metal of the journal and the material of the bearing occurs and obviously is very great and is accompanied by very rapid wear on the materials. This is termed *solid friction*. For this type of friction on surfaces which are clean and dry, the following relations are true:

1—The resistance due to friction, or the drag tending to stop the rotation is approximately proportional to the load applied to the journal or bearing.

2—The resistance due to friction decreases as the velocity increases, except at very low speeds.

3—The resistance due to friction is slightly less for small projected bearing areas and heavy pressures, than for large areas and light pressures.

In this case, the materials are in direct contact and the electro-magnetic fields of force of the particle interfaces are interlocked to the greatest possible degree. For the ordinary materials used in journals and bearings, this friction ranges in value from 0.15 to 0.30.

The second type of friction may be called *semi-film* friction, and occurs when a bearing is so largely overloaded, or so meagerly supplied with lubricant, that the pressure applied is able to reduce the film thickness to an equivalent of only one or two molecules, thus allowing the inevitable small imperfections of the bearing to contact similar small imperfections on the journal, and so setting up a condition where the friction is partly solid and partly fluid. This occurs many times in practice and is nearly always the result of improper design or maintenance. As may be imagined, the wear is severe, but not nearly so great as when solid friction occurs, and very much greater than with full film lubrication.

For these partially lubricated surfaces, the following relations exist:

1—The coefficient of friction decreases as the velocity increases.

2—The coefficient of friction increases as the pressure increases. (For this type of friction its value varies between the value for solid friction and the value for film friction.) It will be found that for various reasons many machine bearings fall in this class.

For the purpose of this discussion, the third type of friction will be called *film* friction, and is the resultant of adequate bearing design and good maintenance. In this case, the lubricant separates the rubbing surfaces to a degree such that the electro-magnetic attraction of the component particles is at a minimum, and hence the friction is lowest.

This condition is, or should be, the aim of the bearing designer and necessitates the provision of bearings and journals of such size that the load components never can be so great as to force the elements into direct contact while in operation. This implies that the lubricant film is always of such thickness that it never is broken at any point in its passage around the bearing surface.

For fluid friction, the following relations are true:

1—The frictional coefficient varies directly with the velocity.

2—The frictional coefficient varies inversely with the pressure.

3—The frictional coefficient varies directly with the viscosity of the lubricant.

4—The frictional coefficient varies inversely as the mean thickness of the lubricant film at the point of minimum clearance.

Illustrating these three types of friction, assume a journal and bearing as shown in Figure 1 where the journal is at rest and lies with metal to metal contact at the bottom of the bearing. Now as the shaft is caused to rotate in the direction of the curved arrow, it will roll like a wheel to the *L* side of the bearing until it reaches a position which corresponds to the angle of

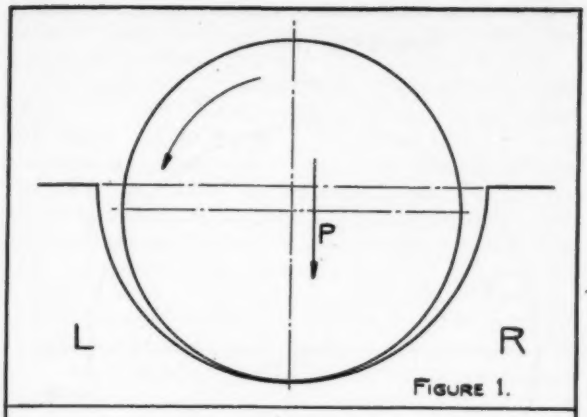


FIGURE 1.

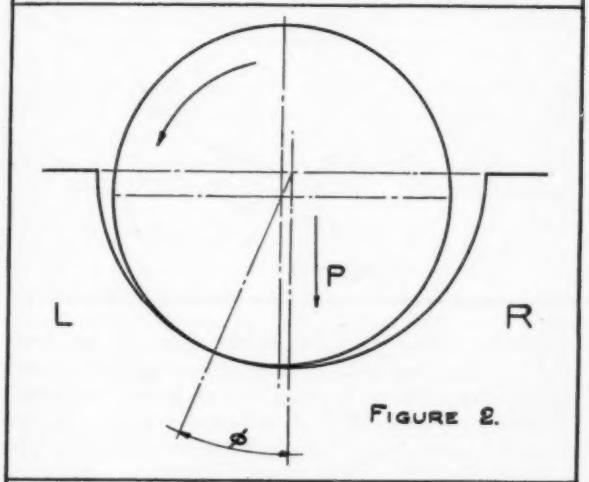


FIGURE 2.

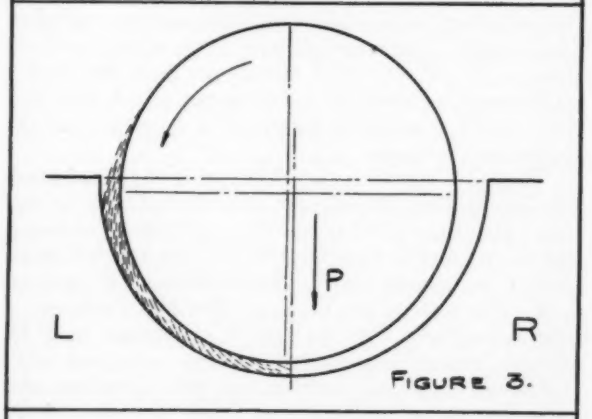


FIGURE 3.

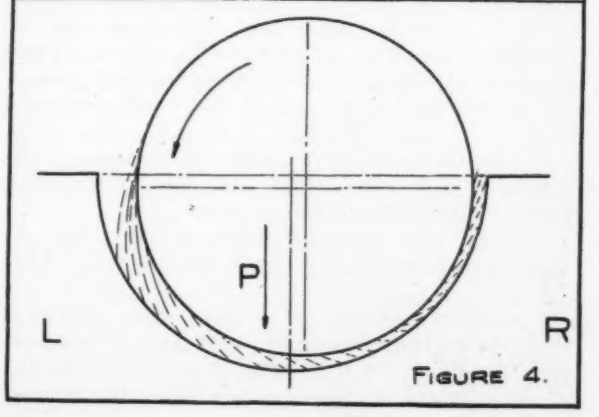


FIGURE 4.

repose, when slightly lubricated, of the materials of which the journal and bearing are made. This is illustrated in Figure 2, and the angle ϕ as shown, is equal to the angle of repose, while the tangent of this angle is equal to the static frictional coefficient, C, of the materials. Upon reaching this point, the journal begins to slide and if the speed of rotation is held constant at this point, it will continue to slide with metal to metal contact, or solid friction.

If, however, the speed is increased further, and no change is made in the applied load, the rotating shaft will begin to draw lubricant between itself and the bearing in such a manner as to tend to force the journal out of contact with the bearing, as shown in Figure 3.

An analogy of this wedging action of the oil may be seen in the blade of a propeller being driven through water. The shape of the blade is such that a positive pressure is built up on one side of the blade producing a thrust which forces the boat forward. In exactly the same manner the loaded shaft is forced clear of the bearing and sustained.

During the movement of the journal, and until the next phase is arrived at, the journal is separated from the bearing by a film of oil approximating molecular thickness, and this is not sufficient to prevent the tiny irregularities of the surfaces from coming into contact, hence the friction is partly solid and partly film, the proportion of each varying throughout this phase, which is termed *semi-film* friction.

As the speed of rotation further increases, the film of lubricant separating the surfaces, builds up to greater and greater thickness, and eventually, if the bearing is not overloaded, forces the journal clear of all contact, and the phase of *film* friction begins. At the time equilibrium is reached, in this phase, it will be found that the journal will have moved from the L side of the bearing to the R side as indicated in Figure 4. Notice that the point of closest approach of the journal to the bearing has moved from the vertical centerline of the bearing to the left and thence to the right side of the centerline.

Now if the load P be increased beyond the capacity of the lubricant film to withstand, the journal will be forced downward until semi-film friction occurs, and if the load be increased still further, the journal will again be forced into direct contact, and solid friction again occurs. With these facts in mind, a plot of the movement of the center of the journal within its clearance space may be made, as in Figure 5. We will assume here that a definite clearance has been given the bearing, and that the circle shown is the path the center of the journal would describe if the circumference of the journal were rolled around the circumference of the bearing. That is, the diameter of the circle shown, is equal to the clearance allowed the bearing.

Now as the journal is started in motion with a constant load, it will roll from A where it is at rest, to B, the angle of repose, where solid friction begins, then depending on the load, at about point C, semi film friction begins, and with further increase of speed rises to D where film friction begins. As the speed is increased further, the center point will rise along the line DE, until at infinite speed it will coincide with the center of the clearance circle. The line DE may be called the line of film friction, and it lies at an angle

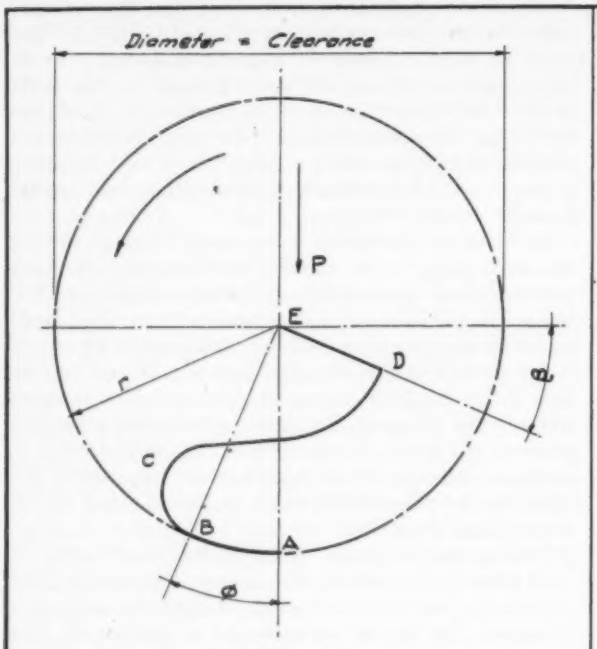


FIGURE 5.

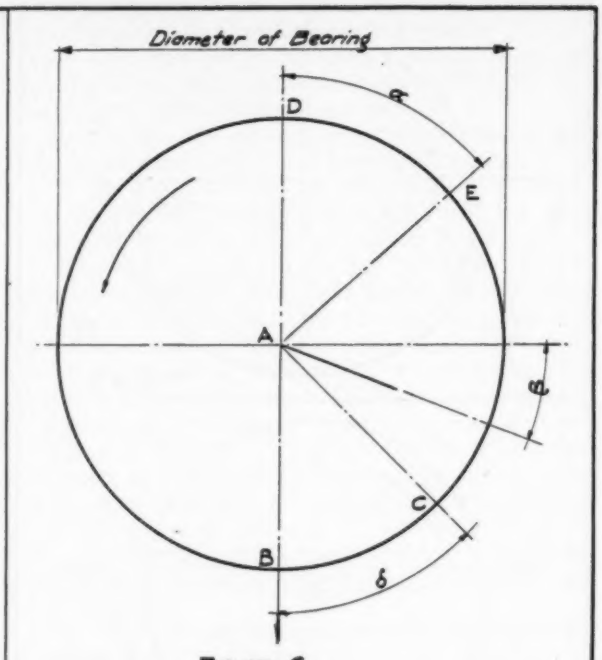


FIGURE 6

of $\beta = 18$ deg. and in length is equal to 0.29 of the clearance or approximately ½r.

If the speed were held constant, then under zero load (the journal itself being considered weightless) the centers of the journal and clearance circle would coincide as before. Now if load were applied, the journal center will move down the line *DE* until at *D* a further increase of load would rupture the film, and the bearing will have reached its maximum load carrying capacity at that speed, under conditions of film lubrication. These examples point out the close interdependence of the speed and pressure. It is evident that for any one combination of load and speed, there is one corresponding position on the line of film friction, to which the journal center will move and remain in complete equilibrium.

In Figure 6, are plotted the zones of varying pressures, plotted on the diameter of the bearing. Assuming that the journal is operating at infinite speed and constant load, in a 360-degree bearing, its center would lie at *A*, and the point of maximum pressure in the lubricant film would lie directly under it at *B*. Now as the speed is reduced, the center will travel downward along the line of film friction, and as this occurs, the point of maximum pressure in the film will move toward *C*, reaching that point when the journal speed has fallen so low that the applied load is about to rupture the lubricant film. At point *C*, the point of maximum film pressure lies at about 45 degrees from the vertical. ($\delta = 45$ deg.)

When the bearing is operating with the point of maximum pressure at *B;* i. e., at infinite speed, the point of minimum pressure in the lubricant film will lie at *D*, or directly above the journal, and as the point of maximum pressure moves toward *C*, the point of minimum pressure moves toward *E*, which is reached as a maximum condition when the point of maximum pressure reaches *C*. Point *E* lies about 55 deg. from *D* ($\alpha = 55$ deg.). The value of the minimum pressure ranges from positive to negative, and Moore *(American Machinist,* March 1903, P. 1281) states that he constructed a bearing which drew its lubricant (oil) by suction through a tube from a reservoir placed six inches below the bearing, thus pumping its own lubricant supply. Dewrance (Min. of Proc. of Inst. of Civil Engrs., Vol. 75, P 362) found a vacuum of 28.4 inches of mercury, or about 13.9 pounds per square inch suction, under certain conditions, at a point beyond the minimum clearance.

This leads naturally to a discusssion of the thickness of the lubricant film, *y*, and, of course, interest is centered about the point of minimum clearance, as that is where the film is first ruptured. From the foregoing, it may be deduced that the film thickness will vary as:

1—The load on the bearing. The film thickness, *y*, varies inversely with the load *P*, decreasing as *P* increases because increased loads tend to squeeze more lubricant out of the bearing laterally. Another phenomenon probably exerts some effect also; due to the elasticity of the bearing housing, it tends to bulge at the point of maximum pressure, thus increasing the film thickness. However, the first effect is so much greater that we may neglect this, and say that *y* varies inversely as *P*.

2—The clearance, or difference in diameters of the journal and bearing, because the greater the space available, the greater *y* may become.

3—*y* will vary as some function of the velocity, *V*, because as the velocity increases, it tends to build the film up.

4—*y* varies inversely as the temperature, because as the lubricant becomes warmer at the point of minimum clearance, due to the work being done on it, the viscosity of the lubricant is reduced which allows the pressure

to force more lubricant from the bearing laterally, thus reducing the film thickness.

The mean film thickness, that is the film thickness at the point of closest approach affects the coefficient of friction. That is, the coefficient of friction varies inversely as the film thickness. Now it is an obvious fact that the smaller the bearing, the smaller the frictional losses will be, so long as film lubrication is maintained. Stating this fact mathematically, it can be said that the coefficient of friction varies directly with the projected area of the bearing. Expressed differently, the coefficient of friction is inversely proportional to the specific load. These facts illustrate the dependence of the various factors. Combining these statements into a formula,

$$f = \frac{Z\,V}{p\,y}$$

f being the coefficient of friction, Z, the viscosity of the lubricant, V the journal speed; and p the pressure per unit of bearing area, or specific pressure; and y the film thickness. Rigorously applied, this equation should be expressed in similar terms, but for practical purposes it is easier to express V in feet per minute; p in pounds per square inch; y in inches, and Z in pounds per square inch for a speed of one foot per minute.

The capacity of a bearing, from a frictional standpoint, is indexed by the coefficient of friction, f, which is the ratio between the load applied to the bearing, P, and the frictional force tending to stop the rotation, expressed as a force acting tangentially to the surface of the journal, F. Then $f = F/P$. Note that the figure expressing the coefficient of friction is a ratio, and is therefore dimensionless.

The coefficient of friction is not a constant, but varies with at least nine components, as will be shown later. The specific load for which the total friction attains its maximum value is higher, the higher the temperature of the bearing. Expressed differently, the coefficient of friction decreases with higher specific loads, provided the bearing temperature is held constant. As a matter of fact, it decreases quite rapidly at first, and then more slowly as the load is increased, and this relationship is entirely independent of the lubricant used and the materials of which the journal and bearing are constructed. From this it is evident that it is neither possible nor desirable to operate a bearing cold. A temperature as high as can be maintained safely without causing damage to the bearing and/ or journal surfaces, and without decomposing the lubricant should be maintained for minimum friction losses, but this allowed temperature should be controlled against further increases. This permits the operation of the assembly at the lowest practical coefficient of friction, and hence at the greatest possible power saving.

The foregoing is proven by the experiments of Lasche, which show that with a bearing at 50 deg. C., (122 deg. Fahr.) the product of the specific load and the coefficient of friction is a constant. Lasche's experiments were conducted with a nickel steel journal running with the lower part submerged in an oil bath, and using a babbitted bearing. He found that when the speed of rotation was held at 32.8 feet per second, the coefficient of friction decreased as the temperature increased. With a constant temperature of 50 deg. C., the coefficient of friction increased with the velocity.

Thin, highly mobile liquids, such as gasoline, kerosene and water, have low viscosities, and conversely, thick, sluggish liquids, as tar, cup grease and molasses have high viscosities. From the foregoing statements on the mechanism of lubrication, it will appear that the quality of a lubricant upon which the friction of a bearing depends most, is its viscosity. Viscosity may be defined as the internal friction within a fluid, which tends to resist the sliding of one particle or layer over another. The quality of viscosity in a lubricant may be regarded as the resistance which the molecules of the lubricant exert to shearing stresses. The unit of viscosity is often expressed in poises, or in its associated unit, centipoises, 100 of which equal 1 poise. From this unit, viscosity may be converted into any other unit, as dynes or the nameless English unit of pounds divided by foot seconds or into the commercial units, Saybolt seconds, etc.

The coefficient of viscosity is the force necessary to move with unit velocity, one unit area, under unit pressure, when the surfaces are separated by a unit thickness of the liquid. Roughly, the coefficient of viscosity, Z, varies inversely as the temperature.

The molecules of a lubricant closest to a rotating journal surface, move with the journal at very nearly the same speed, and if the film is considered to be a laminar structure of many layers, each successive layer moves at a lower and lower speed until the last layer on the bearing surface which will be at rest, or very nearly so.

Because the coefficient of viscosity is a measure of the shearing strength of the lubricant, and the lubricant is under this type of stress while in the bearing, it may be of any chemical composition; i. e., oil, water, etc., and its composition does not affect the bearing performance. The viscosity being the only property which need be considered.

Tower experimented with drip feed lubrication and found that it was entirely impossible to secure consistent results because the supply of lubricant was irregular, and that only by means of a lubricant bath was he able to secure accurate results. He drilled a hole in his bearing to supplement his oil bath with a drip feed, and he found that with the journal rotating, oil rose in the drill hole and overflowed.

Later he constructed a bearing with a multiplicity of holes for pressure reading over the whole of the bearing surface. He loaded his bearing with a specific pressure of 341.5 pounds per square inch, and found that the highest bearing pressure was not located in the geometrical center of the bearing, but was displaced away from the center in a direction corresponding to the point of closest approach. All around the edges of the bearing the pressure was practically zero. Along the length of the bearing the pressure was highest near the center and became progressively less as the edges were approached.

The work done by friction, serves to heat the bearing, and the temperature to which it will rise must be controlled. This is accomplished by geometrically proportioning the bearing, cooling with air or water indirectly, or cooling with the lubricant directly. The work of friction, Wf, expressed in foot pounds per second,

per square inch of projected area is $Wf = f\ p\ V/60$, where f is the coefficient of friction, p the specific pressure in pounds per square inch, and V is the velocity of rubbing in feet per minute. In a well balanced design this must be equal to or less than the capacity of the bearing for disposing of the heat.

As before stated, the coefficient of friction of a journal bearing is a function of at least nine variables, which may be listed as follows:

f, the coefficient of friction.

Z, the viscosity of the lubricant in the film at the temperature obtaining at the point of closest approach, expressed in centipoises.

n, the speed of rotation of the journal, r.p.m.

p, the specific load on the bearing in pounds per square inch of projected bearing area.

c, the diametrical clearance between the journal and bearing, inches.

d, the diameter of the journal, inches.

l, the length of the bearing, inches.

m, the method of applying the lubricant.

o, the oiliness factor of the lubricant.

s, the surface conditions of the journal and bearing, the materials of which they are made, their smoothness, etc.

The accepted theory of film friction was developed independently by Petroff, (Neue Theorie der Reibung, Leipzig, 1887) and by Osborne Reynolds (Phil. Trans. 1886). It is believed that Hersey (Trans. A. S. M. E., 37, 1915, P 167) was the first to propose the correct means of expressing their interdependence mathematically.

It was stated before that the coefficient of friction, f, is a ratio, and is therefore a dimensionless or pure number, and it is therefore necessary to combine the above factors in such a manner that their combination results in a dimensionless term. This has been done in the following manner:

$$f = \left(\frac{Zn}{p}\right)\left(\frac{d}{l}\right)\left(\frac{c}{d}\right) s\ m\ o$$

(Note that the expression (Zn/p) really is a dimensioned term, but it is more conveniently expressed in this form than the theoretical modulus, which is dimensionless, and to which it is directly related, because it involves customary engineering units.)

For any journal and bearing, changes in f will be defined by (Zn/p) and o. Now for a case where o, the lubricant is constant, changes in f are determined solely by (Zn/p). This modulus is called the characteristic load term. Identical values of f are obtained for uniform values of (Zn/p), regardless of changes in the individual variables. It will be noted that the characteristic load term contains the three principal factors which control the operation of a bearing; i. e., the speed, the unit pressure, and the viscosity of the lubricant.

Expressed in this form they state that the effect on f of doubling the speed, doubling the viscosity, or halving the load, is identical. This is known to be true from experiments. The lubricant film thickness is affected in the same way. The expression (d/l) indicates that the coefficient of friction is halved when the bearing length is doubled, while (c/d) states that f is a direct function of the ratio of the clearance to the diameter. This ratio has the effect of doubling the coefficient of friction as the clearance is halved. The terms s, m, and o have no effect under conditions of film friction and are not included in the formula when film friction is considered. Under conditions of film friction, the formula is written:

$$f = (Zn/p)\ (d/l)\ (c/d)$$

As will be seen, this method is logical, and withstands mathematical analysis. It has furthermore stood the test of time, and since first being proposed has come into general usage.

Because most bearings have similar ratios of (d/l) and (c/d), regardless of their size, they will have closely similar relationships between f and (Zn/p). When a journal and bearing operate at comparatively high ratios of (Zn/p), that is at high speeds or at light loads, the journal is operating under conditions of film friction. Experiments have shown definitely that under these conditions the viscosity of the lubricant is the only property of the lubricant which affects the coefficient of friction. But when the value of the modulus (Zn/p) becomes sufficiently small no film is maintained and the bearing is operating under semi-film conditions and the factors s, m and o become important. Lubrication is had in this case principally from the ability of the lubricant to adhere to the surface and the factors of oiliness, etc., are involved. There is, therefore, some value of (Zn/p) where a transition occurs from film friction to semi-film friction. This value can be located approximately from the equation,

$$p = 7.47\sqrt{v}$$

Thus the arrangement of the variables, which are functions of the coefficient of friction, into four groups, makes possible the general correlation of the effects of the different variables, and experimental results are dependent only upon geometrical similarity and not on congruence of the parts.

Now in the light of facts which have been mentioned, consider an actual case of mistaken millwrighting which occurred several years ago. In a certain machine, operating according to the manufacturer's specifications, the bearings ran with only slight wear and quite cool. The machine was rebuilt, speeding up the shaft by nearly 100 per cent but not materially increasing the load on the bearings. At the higher speed the bearing constantly ran very hot.

The master mechanic decided that a larger shaft was required, and rebabbitted the box for a 10 per cent larger shaft. The bearing then ran so hot that even a hose playing on it did not serve to control the temperature. The old shaft was replaced and is still in place with the help of a water hose to control the temperature.

Now heat is a manifestation of work, and work is produced by a force acting through a distance. In increasing the speed of the journal, the work done was increased because the same force acted through a greater distance, hence the heat was increased. No change was made in the bearing box, therefore its heat dissipating characteristics were not altered and were insufficient to dissipate the greater amount of heat generated, and the bearing heated up.

Then the larger journal was installed, but without adding any improved heat dissipating characteristics.

Now the distance through which the force was acting was further increased by the larger diameter, and the bearing violently overheated. If a new bearing of the larger diameter had been installed, it would have still overheated, because while the heat dissipating area had been increased, it would only have been increased in proportion to the increase in diameter and this would not be enough to offset the additional velocity and there would still be a tendency to overheat.

If the master mechanic had only lengthened the bearing, keeping the shaft the same size he would have reduced the unit pressure by providing more bearing area, and thus lowered the coefficient of friction to offset the increase due to the higher speed. Then the increased heat dissipating area of the bearing would have handled the heat generated nicely.

If he had remembered that all high speed bearings are constructed with relatively small diameters and long lengths, and had reduced the shaft size at the same time increasing the bearing length, so that the unit pressure remained constant, the rubbing velocity would have been reduced together with the coefficient of friction, and this combined effect would reduce the heat generated so that an even cooler running bearing would have resulted.

In order to design a satisfactory bearing, the designer must have a complete knowledge of the conditions of operation and must be able to recognize the type of failure most likely to occur. For example, the failure of a bearing by abrasion is an indication of solid friction, and the thickness and maintenance of the lubricant film must be studied. Failure by seizing demands that the thermal expansion be considered; failure by overheating requires that the clearance be investigated together with the local shear in the lubricant film.

The author has not attempted to do more than to point out what happens in bearings under various conditions, and disclaims any intention of presenting an exposition of design methods, fully appreciating that modifications of the formal equations given, are desirable for design purposes.

I-Beams in the Paper Mill

W. F. SCHAPHORST, M. E.

HOW much will any I-Beam hold?

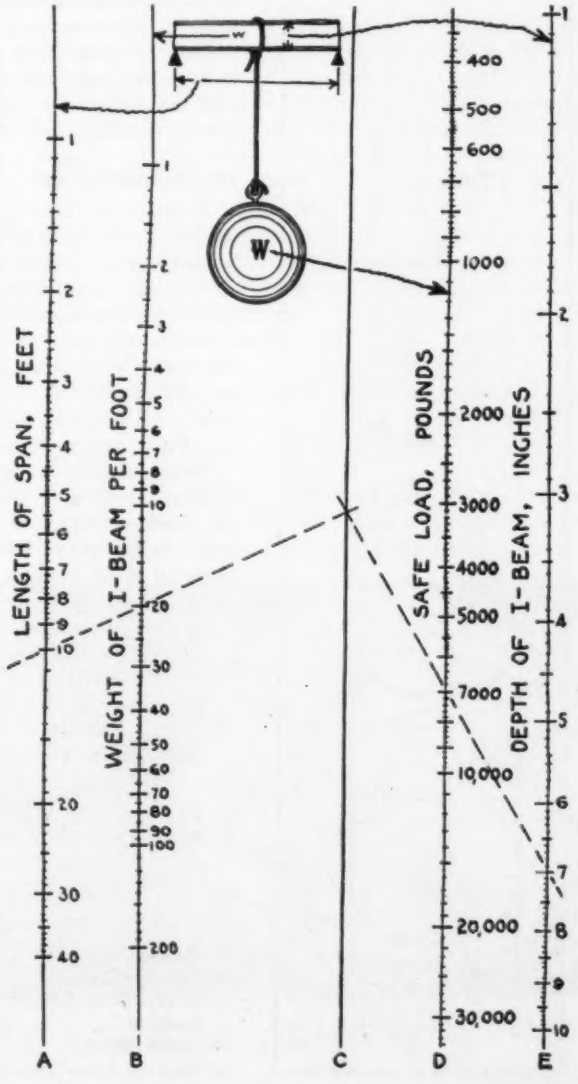
This chart answers the above question which has been asked by many a paper mill operator. No computations are necessary. The chart tells how much any ordinary I-Beam will hold under the very worst condition, with the load concentrated in the middle of the span as shown by the sketch on the chart. The chart is based on concentrated loading for the sake of safety.

Let us suppose that a weight of 4,000 lb. must be supported in your paper mill. A 7-inch I-Beam, weighing 240 lb. is available. It is 12 feet long, and therefore weighs 20 lb. per foot. The minimum distance between supports that can be obtained for the lifting operation is 10 feet. Is the I-Beam strong enough to lift the 4,000-lb. load?

The dotted lines drawn across the chart show how the problem is solved. Run a straight line through the 10-ft. (column A) and the 20-lb. (column B), and locate the intersection in column C. Then, from that intersection in column C, run over to the 7-in. (column E). The intersection through column D shows that the I-Beam will support 7,000 lb. Since the load to be lifted is only 4,000 lb., the beam is amply strong. In fact, the reader can easily find, by applying the chart, that a 4-inch I-Beam, all other conditions being the same, would safely support the load of 4,000 lb.

Similarly, it is easy to ascertain the maximum allowable span when the factors in columns B, D and E are known. Or, the necessary weight per foot of I-Beam, may be determined when the factors in columns A, D and E are known. Lastly, the depth of beam is determinable when the factors in columns A, B and D are known.

For loads that are uniformly distributed—not concentrated—the safe loads in column D may be multiplied by two. Thus, the above described beam will support a uniformly distributed load of 14,000 lb., or 1,400 lb. per running foot.



The Natural Cellulose

CURT WEIL

A VAST amount of work has been done during recent years in the field of cellulose research by scientists of the entire papermaking world; and names like Lüdtke, Mark, Meyer, Hess, Kress, Bialkowsky, Trogus, Scarth, Strachan, Schwalbe, Clark, Campbell, Nakano, Cottrall, Bell, Katz, Herzog, Ritter, and Freüdenberg are well recognized in such scientific circles. Other names might also be added to this list, but, incomplete as it is, it indicates to some degree the importance of this line of research and the need for the solution of some of its problems.

Naturally, the individual viewpoint of each of these investigators differs slightly in one respect or another. The individual concept of the cellulose fiber and its hydration has been presented in numerous long reports of experiments and detailed articles which in many instances found their way into the pages of various chemical journals throughout the world. Such articles, of course, have been highly scientific and a thorough knowledge of organic chemistry and physics is required to understand them.

Nevertheless, it is believed that the different viewpoints of these investigators may be reduced to a common denominator of such character that the structure of the cellulose fiber and the phenomenon of beating may be more easily understood by the more practically minded papermaker as well as by the designer and builder of such stock preparation equipment as beaters, Jordans, refiners and hydrators. Such an understanding makes for a better appreciation of the kind and amount of work which must be done to a raw material in order to obtain desired results in the finished product with a minimum of power input.

The Cellulose Fiber

A theoretical concept of the structure of a fiber is illustrated in Figure 1. The center of this fiber is occupied by the lumen (A) which is surrounded by the tertiary lamella (B). It is probable that the lumen was filled with protoplasm during the early stages of the fiber growth and that the tertiary lamella was a wall which protected this very delicate substance against injurious influences from the outside. This tertiary lamella is not of cellulosic nature but is of a foreign substance which is probably furfuroidal in character and which is designated hereafter as "skin substance," because of its resemblance to a very fine skin. Although it is still a matter of opinion, mention should be made that this lamella is said to be missing in fibers of certain woods.

Then follows the secondary lamella (C, C_1, C_2, C_3) which is arranged in several layers and divided by concentric rings of skin substance (D). In the illustration it may be noted that the different layers are growing one over the other in the entire fiber; and that when layer C_3 is removed it exposes C_2, the removal of C_2 exposes C_1, and the removal of C_1 exposes C. This arrangement might be likened to an assembly of several short sections of hose of different diameters one inside the other.

The different layers may represent periods of growth and these units of growth are separated by skins similar to the layers of an ordinary onion. These periods, of course, are not a matter of years as are the rings in a tree, but of days. Perhaps they represent the daily growth of the fiber.

These layers are longitudinally subdivided by fine skins (F) into strips (E) which are wound spirally around the axis of the fiber. These strips, arranged to give the fiber its greatest possible strength, are alternately right and left hand spirals. In the illustration it may be noticed that the strips are wound left hand

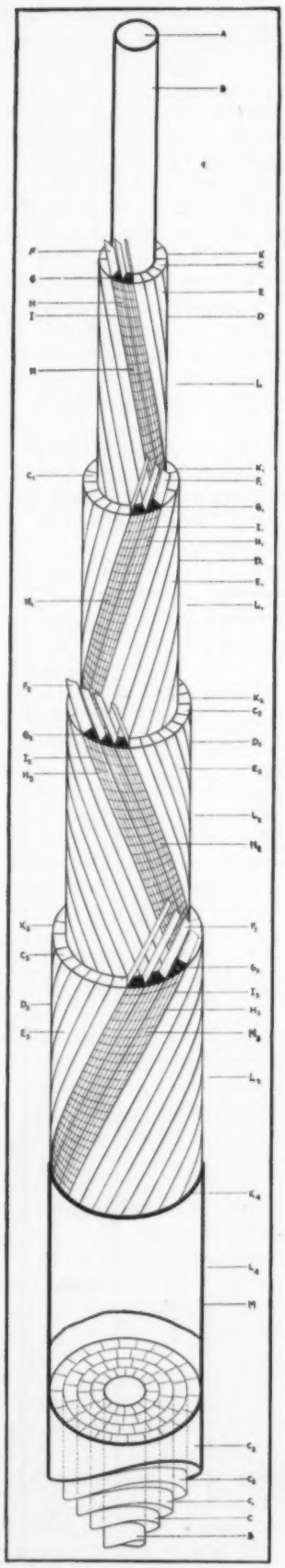


Fig. 1—The Lüdtke Fiber Structure

A—Lumen
B—Tertiary Lamella
C—Layers of Secondary Lamella
D—Layer Skins
E—Strips
F—Strip Skins
G—Fibrilla
H—Dermatosomes
I—Dermatosome Skins
K—Crosselement
L—Fiber Section
M—Primary Lamella
N—Fibrilla Skins

Fiber and Its Hydration

in the inner layer, and that in the layer surrounding it the spiral is right hand.

The angle of pitch at which these strips are wound is not fully known as yet; but it seems that the strips of the inner layer, nearest the lumen, are almost parallel to the axis of the fiber while the strips extending outward have a progressively smaller pitch. The inner layers, therefore, maintain strength in longitudinal direction while the outer layers more or less protect and hold together the inner ones.

The strips are built of fibrills (G) which are the smallest microscopically visible building units of the fiber. Probably these fibrills are separated by fine skins (N). Some investigators believe that they are cemented together by a colloidal interfibrous substance. The fibrills again are said to be transversely subdivided by fine skins (I) into still finer units (H) which are called fusiform bodies, dermatosomes or crystallites. These granules, visible by carbonization of the fiber, are the smallest building elements of the fiber surrounded by skins. The fibrills are cellulosic in character.

The secondary lamella, likewise, is covered by the primary lamella (M) which is also of skin substance. In fact, it is highly probable that the outer lamella, the tertiary lamella, and the separating skins are of the same furfuroidal nature.

Some investigators believe that cross-elements of skin substance (K), totalling about 10 to 100 in a fiber, penetrate the fiber as if they were transverse discs and thus divide it into numerous transverse sections. Probably the fibrills penetrate these cross-members but this is not definitely known. Lüdtke, for instance, believes that the fibrills are grown to the discs and therefore the length of a fibrill is limited to the distance between two members. On the other hand, there are several investigators who claim that such cross-members are not present, but it seems probable that there is a medium, resembling the nodes of bamboo or corn, which reinforces the skin-skeleton of a fiber. The appearance of a beadlike necklace in a fiber when swollen in cuprammonium reagent, however, may be proof of the existence of the more resistant membrane. The fact that acetylization of a fiber first causes the acid to penetrate along crosslines at regular distances and then along longitudinal lines before the cellulose is dissolved may serve as additional proof.

It is believed that a fiber is composed of a strong skin skeleton where all skin elements are grown together. This skin skeleton is of a substance which is furfuroidal in character and that the spaces of the skeleton are filled with cellulose. The total amount of skin substance is very small, probably not exceeding 0.2 to 0.5 per cent of the total fiber substance. The presence of this skin substance, however, indicates the lack of homogeneity in the fiber structure, a fact of importance in beating.

The fusiform bodies, crystallites, or dermatosomes are composed chemically of molecules or micells, the micells being of cellulose crystals, and the crystals of glucose groups. The unit cell of a crystal is formed by four glucose groups and the size of a crystal is about 10 Å x 8 Å x 8 Å (Å is one Angstrom unit and is equal to 1/10,000,000 millimeter). The molecule or micell is composed of chains of from 30 to 50 glucose units which are bunched together in groups of from 40 to 60 chains. The size of the micell may be 30 to 50 $\mu\mu$ x 3 to 5$\mu\mu$. About 75 of these micells form a crystallite or dermatosome of which the size is about 0.3 to 8 μ x 0.5 μ. Twenty to 100 of these fusiform bodies, when put one after the other and covered with a skin, form a fibrill of which the dimensions are 0.3 to 0.8 μ x 15 to 60 μ; while the dimensions of an ultimate fiber, formed by 10 to 100 fibrills approximates 200 to 2000 μ x 20 to 30 μ.

Hydration

With this knowledge of the structure of a fiber as a background, it is easier to understand the changes which a fiber undergoes when it is treated mechanically

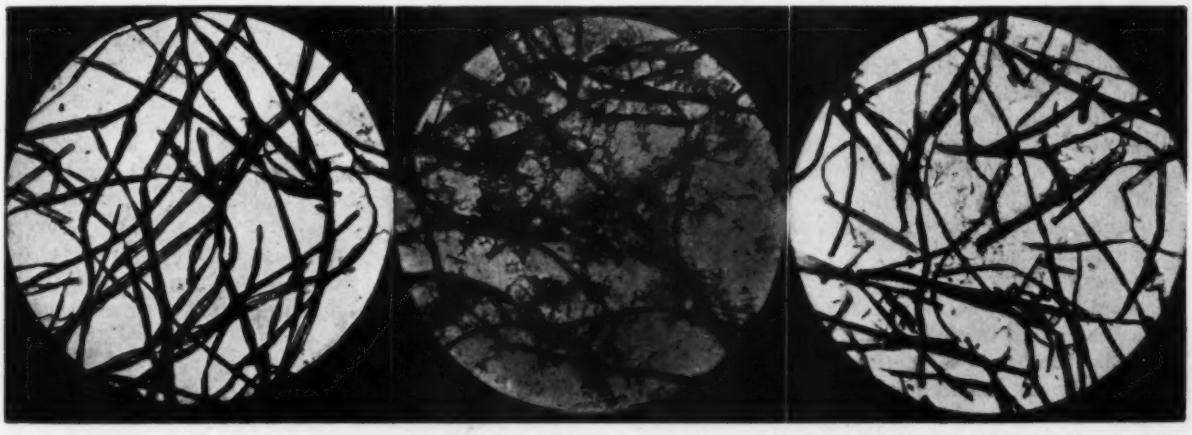


Fig. 2—Disintegrated kraft fiber

Fig. 3—Well fibrillated and hydrated kraft fiber

Fig. 4—Poorly fibrillated and overcut kraft fiber

in the presence of water, and reveals the need of a thorough understanding of this phenomenon by designers of stock preparation equipment. It is obvious also that such a delicate raw material should be treated with precision machines and that these machines should be handled with utmost care.

Fibers are often delivered to the mill in a dry stage, interwoven together into sheets of convenient size. In such cases, the lumen of each individual fiber is occupied by air as are the spaces between the fibers. This air has to be removed and replaced by water, the fibers having to be soaked to make them plastic.

Such a soaking process, when fibers are placed simply in a water-filled chest, requires approximately 24 hours, while the same work might be accomplished in a beater within a few hours. Of course, the time interval in each case would be affected somewhat by the kind of fiber receiving treatment.

This soaking of the fiber is accompanied by swelling whereby the surface of the fiber is increased and given the ability to hold more water. This is an important fact as further swelling after continued beating is not noticeable.

When the fiber is treated further in the beater it undergoes certain changes which have been designated as *hydration*. This term in a strictly chemical sense is understood to mean the formation of a compound of water and another substance in certain lawful proportions of the molecules. The water, bound by a strong force to the corresponding substance, cannot be separated easily from it by means of mechanical treatment. On the other hand, if water is bound physically to another substance, the action is known as imbibition or adsorption.

It is a well-known fact that chemical reactions as well as physical reactions take place much faster when the substances involved are in a very fine state of division. This condition causes the surfaces of the substances to be greatly enlarged and in consequence there are more points of active contact. If the particles or granules are of very small size, they are said to be in the colloid stage. In this condition they very readily take up water and hold it with greater tenacity than is noticed generally in purely physically bound materials. These small particles of a colloid are larger than the particles of a solution but smaller than the particles of a suspension. If these particles are individually smaller than 0.5 μ, they cannot be seen even with the best microscope on account of the length of light waves and the strength of the light. They can only be recognized by the so-called Tyndall effect, which is the dispersion of light rays of colloids and magnification at the same time with the ultramicroscope. It may be understood, therefore, that it is difficult to distinguish the way in which water is bound to a colloid, whether it is a physical or chemical combination.

Nevertheless, it is possible to discuss in a purely mechanical sense what takes place when a fiber is beaten in a beater. In the first place, the outer layer or primary lamella has to be damaged or bruised by a gentle action. By this action, the fibrill bundles and also individual fibrills of the first layer are loosened. Continuing this process will loosen all of the fibrillae and actually detach some of them.

If a strong paper is to be made, it requires only a fibrillation of the outer layers. The inner layers may remain intact. The loosened fibrills with their greater flexibility and better interweaving possibilities together with the strength of the inner layers assure the structural strength of a sheet. This greater strength of a piece of paper made from carefully fibrillated fibers is due to the fact that more points of contact are created to develop friction and to decrease slippage of fibers.

The loosening up of the proper amount of fibrillae or the fibrillation of the fibers to the proper depth, therefore, determines the paper to be made. A careful study of Figures 2, 3 and 4 will further emphasize this point. Figure 2 shows a kraft fiber that has only been disintegrated; Figure 3 a properly beaten and fibrillated kraft fiber as used in the manufacture of paper for conversion into cement bags, and Figure 4 a kraft fiber which has been much less fibrillated but overcut.

It may be noticed in studying Figure 3 that a strong fiber core has been preserved; that only part of the fiber has been fibrillated; and that some of the fibrillae have become detached entirely from the fiber. This beating was done very carefully in order to preserve the length of the fiber.

The cutting of the fiber as revealed in Figure 4 indicates the uneconomical use of a long fiber. Such cutting not only increases the power requirements for beating but also precludes the use of shorter fiber which could be mixed with the longer fiber in the right proportion to give such formation qualities as desired.

Tests made on the same three samples of stock as reproduced in the illustrations gave the results shown in the accompanying table.

Fig.	Beating Time	Kw. hrs. per ton	Mullen	Tear	Freeness Min.	Freeness Sec.	Per cent Increase Mullen	Per cent Increase Tear
2	Disintegrated	...	23.1	390	..	10	...	...
3	3 hrs.	306	58.8	429	1	20	50.6	3.38
4	6 hrs.	714	34.1	275.1	1	16	6.7	4.12 (decr.)

Such figures illustrate what a good beaterman can do to a fiber as compared to the improper handling of beater equipment by a careless operator. It should be pointed out that a good fiber, in the case of Figure 4, was destroyed with an enormous power input.

In addition to the purely mechanical action of lengthwise splitting of fibers into fibrills, beating also produces fiber fragments or debris and a structureless slime or mucilage. The production of this mucilage, which is a colloid in the gel form, is very important.

Every papermaker knows that there is something more than the mechanical felting of fibers and fibrills in making a strong sheet of paper. It is the development of this colloidal material which not only covers the surface of the fibers but to a certain extent is also absorbed by them as well as filling the pores and spaces between the fibrills and fibers so that when such material is felted into a sheet of paper and dried, the entire mat is cemented together and slippage of fibers is retarded.

The disadvantage in the development of this colloid, which results from the bruising of the Lüdtke membrane system in the fibers and not from soaking, is the

shrinkage of paper and the other unpleasant things associated with it.

This gel develops only when natural cellulose is beaten in water, a fact which may be considered as proof that the cellulose fiber at time of growing was a colloid in liquid form and formed by coagulation. Water, therefore, is held by the fiber in two ways. In one case, it is held by the relatively weak face of capillary attraction or porous imbibition; in the other, it is a stronger force which colloidally binds the water of imbibition. Thus, the term hydration, when used in papermaking, refers not only to the fibrillation of the fiber but also to the formation of a colloid gel on the wet fiber.

Since layer after layer of fibrills has to be separated from the fiber in a gentle way, and since all layers cannot be loosened up at once without destroying a large number of fibrills, it seems that the hydration process is still largely dependent upon the time element and that the time required for hydration cannot be made shorter with standard beating and refining equipment without cutting and damaging the fiber.

Static Electricity in Paper*

IN ORDER to understand the phenomena associated with static electricity in paper, and to determine the best steps to take for its elimination, it is necessary to appreciate certain facts concerning static electricity generally. These are:

1. Any properly insulated body can be charged electrically.
2. All bodies are more easily charged when dry.
3. An electrified body in air tends to lose its charge. Air is a better conductor of electricity when moist than when dry and consequently electrical charges leak away more easily in moist air.
4. Electrical charges are of two kinds, negative and positive.
5. Charges of the same kind repel each other; unlike charges attract. Uncharged bodies are attracted to charged bodies.
6. The kind of charge given to a body by friction or pressure depends upon the nature of the two bodies coming into contact. If one body is charged negatively the other will be charged positively. The negative and positive charges so produced will be of equal magnitude.
7. The electrical charge on an insulator remains where it is applied or generated, but on a conductor it is distributed over the outer surface according to the latter's curvature, the charge being most intense at the points of greatest curvature.
8. If a pointed and earthed conductor is held near an electrified body, the charge will rapidly leak away to earth through the conductor.

Paper, if subjected to friction or pressure, etc., may become charged electrically and this will happen most readily when the paper is dry and when the relative humidity of the surrounding atmosphere is low.

If two sheets of paper are rubbed together, one sheet is charged negatively and the other positively, the charges being of the same kind on both sides of the same sheet. This fact explains why it is difficult to separate sheets from the pile when the paper is charged electrically. The friction and pressure to which the paper has been subjected result in alternate sheets being charged negatively and positively and the force of attraction between the electrical charges of opposite kinds prevents the sheets being separated readily.

On paper-making machines conditions are extremely favorable for the generating of static electricity. The web of paper is dried by heated metal cylinders and the frictional forces and pressure acting on the paper as it passes over them and through the calender stacks is sufficient to produce electrical charges of high voltages, and it is common to obtain sparks several inches long from the paper when being reeled up unless precautions are taken to discharge it.

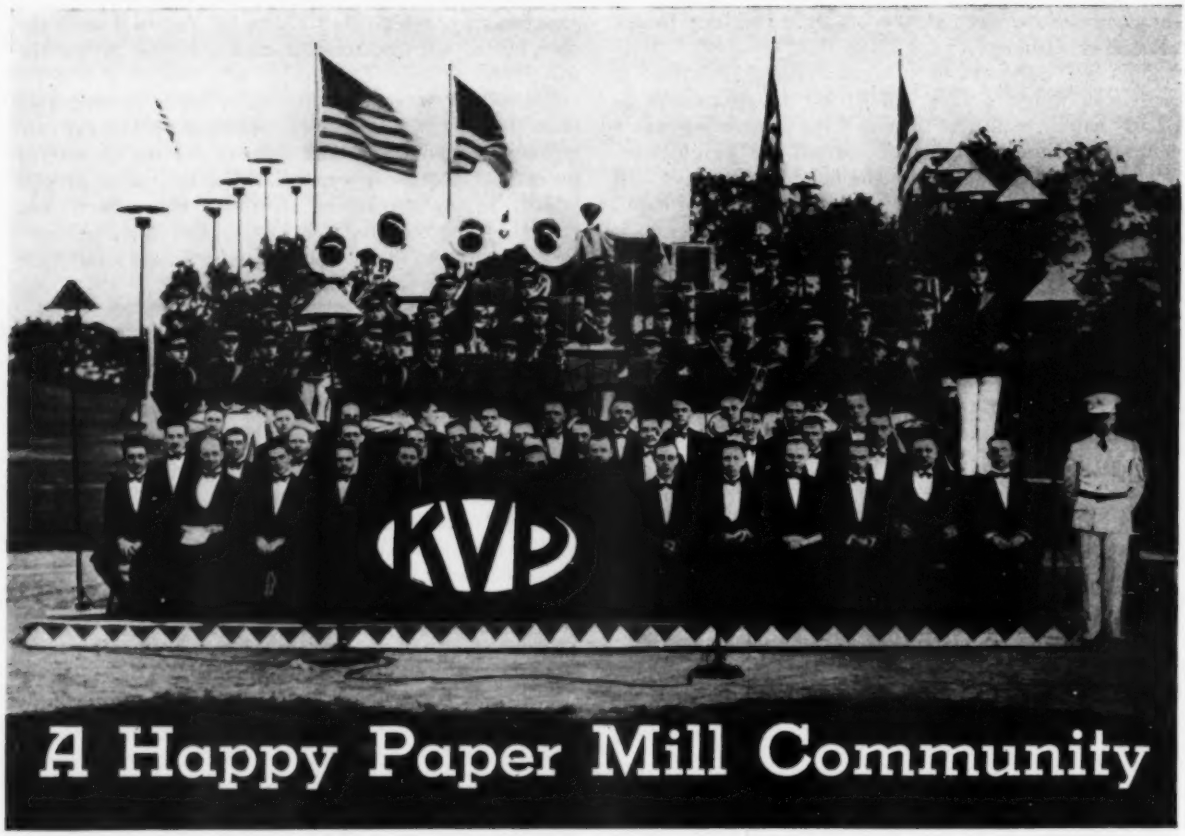
It has already been pointed out that an electrified body tends to lose its charge on storage particularly in fairly moist atmospheres, and paper which is stored under these conditions will eventually become discharged. This arises in two ways; first, the moisture content of the paper will increase, making it a better conductor, and secondly, the surrounding moist atmosphere will conduct the charges away fairly readily. For these reasons it is usually found that paper which is freshly made gives more trouble with static electricity than one which has been "matured," but it must be understood that it takes a long time for the atmosphere to appreciably affect paper which is stored in tightly wound reels or in large stacks.

Static electricity appears to be more troublesome with papers of low substance, this being due to the fact that materials light in weight are more easily affected by the forces of attraction and repulsion arising from the electrical charges. The dimensions of the paper do not appear to affect the problem much beyond that a large sheet is more difficult to control if static electricity causes trouble.

No evidence has, as yet, been forthcoming which suggests that the formation of the sheet is a factor affecting the susceptibility of a paper to static electricity, but it would be useful to examine this subject a little more closely than has hitherto been possible.

An interesting communication was received from Herr Alphonse Baruch, of the Automat-Papier-Fabrik of Hamburg. He stated that the difficulty of static electricity in paper has been successfuly overcome in his business by having the paper specially made to contain about 2.5 per cent of common salt. This material being hygroscopic tends to increase the moisture content of the paper, and being itself a conductor will not allow any electrical charges to accumulate. He states that "the use of paper thus impregnated [with common salt] shows no disadvantages as to any qualities of normal paper."

(*) Abstracted from report of the Printing Industry Research Association, as published in *The Paper Market*, February 18, 1935.



A Happy Paper Mill Community

KVP Band and Kalamazoo Male Chorus giving a Concert in Kindleberger Park

A LITTLE more than two miles north of the City of Kalamazoo, Michigan, lies the Village of Parchment. Here amid idyllic surroundings, yet enjoying every comfort and all advantages of modern times, live the executives and employees of the Kalamazoo Vegetable Parchment Company, that modern, well-known paper manufacturing plant, with buildings extending more than a mile in length and valued at more than ten million dollars. The company has just celebrated its silver anniversary.

Jacob Kindleberger, the head of this great enterprise, came to Kalamazoo in 1909 seeking a location for a paper mill. Business conditions were rather favorable at that time and Kalamazoo had already become known as a paper center. All buildings suitable for use as a paper mill were occupied, but after considerable looking about, Mr. Kindleberger found an abandoned sugar beet factory which stood in the middle of a cornfield about two and one-half miles north of town on the banks of the Kalamazoo River. Barely half a dozen farm houses, some in a poor state of repair and uninhabited, lay scattered about the valley and on the nearby hillside. The road leading to this old building followed the river bank and was hub-deep with mud. But Mr. Kindleberger had a vision of a paper mill, and this was the only available building. He spent the first winter having the old factory rehabilitated and made ready for parchment machines. Most of the few employees walked out from Kalamazoo or

Jacob Kindleberger, founder and president of Kalamazoo Vegetable Parchment Company

came in horse-drawn vehicles, but several, principally those who had come on from Ohio with Mr. Kindleberger, actually lived in tents the first two winters. Mr. and Mrs. Kindleberger and their young son lived in the office of the old sugar beet factory.

Of those first employees, four beside Mr. Kindleberger still remain with the company. *The Parchment News*, the village newspaper, recently published an interview with Henry Butler, one of these old timers, in which he told of those early experiences in a vivid though humorous style. Speaking of the tent in which he lived that first winter, he said they covered it with snow to hold the heat, but someone stole the tent and they never knew it until the first of June. Of course, he may have been romancing a bit.

It was, of course, inevitable that such faith in the future, the endurance of hardships, and an undaunted determination to succeed should bring the realization of those early aspirations. The employees felt the spirit pervading the enterprise and wanted to become permanent. They were all anxious to "pitch their tents" and to be nearer the plant. And so it was not long until all of the empty farmhouses were occupied and others appeared in the valley and on the hillside.

The old beet sugar factory was soon outgrown and in 1916 a new paper mill was under construction to make the raw stock for parchmentizing which previously had been bought from other manufacturers.

Let us take a trip to the Village of Parchment and get a close-up of the lives of these happy people who belong to the KVP organization.

The village is incorporated and now has a population of over one thousand. It is economically managed and entirely modern with every convenience of the city. It pays its bills and the tax rate is only one-fourth that of Kalamazoo. There is no jail or poorhouse. There is no postoffice, but mail is delivered through Kalamazoo.

Parchment has a very fine public school which offers a ten-year course. Upon completing studies at this school, children are sent to the Kalamazoo High School for the last two years at the expense of the village.

Two doctors and a dentist reside in the village, which insures the residents ample medical and dental services.

The Community House, which is the center of the social and religious activities of the village, was one of the management's early contributions to the welfare of its employees. About the time the new paper mill was built in 1916, a building was erected which became known as Welfare Hall. This provided a meeting place for employees and residents of the village where entertainments were held ranging from boxing matches to chautauquas. The hall was soon outgrown and was replaced by the present Community House, which originally accommodated about 400. During the past year the auditorium has been enlarged to seat 1500 people and a large stage added which is equipped in the modern manner. A new gymnasium was also a feature of the improvements and there is a large, modern kitchen and dining room, the latter large enough to accommodate 300 people at one time.

The commodius auditorium of the Community House is used for church services and Sunday School. In the early days of the company's existence, Mr. and Mrs. Kindleberger organized a Sunday School which met at the home of one of the farmers living near the mill. From this beginning grew a church organization, undenominational in character, which later became known as the Union Methodist Church. The congregation now has the services of a minister, and although the membership of the church is made up principally of KVP employees, the management has made no attempt to influence its people to become affiliated as members.

Athletics has a prominent place on the social calendar of the KVP employees. For many years KVP had a team in the city's major twilight league and some first-rate teams were turned out, a number of ex-big leaguers often contributing to the line-up. It was found, however, that intense baseball activity could produce some harm as well as good; therefore, two years ago the KVP participation in intra-city games was abandoned because the rivalry became too bitter. The best players of the KVP team and of other teams in the city then formed

Above—New KVP Community House overlooking Kindleberger Park. Below—Parchment School

what is known as the All-City team. This team uses the Parchment Baseball Diamond as its home ground, and it is managed by KVP men. They play teams from other cities in the state and elsewhere, and in the fall take on some of the big league barn-storming outfits, thus far maintaining a clean slate against the latter, among whom may be mentioned Guy Bush, Gabby Hartnett, Bill Jurges and one or two others from the Chicago Cubs.

The baseball diamond is said by big league players to have as good an infield as any big league team enjoys. It is situated in the center of a natural amphitheater in Kindleberger Park, a beautiful little park of forty acres, the ground for which was given by Mr. and Mrs. Kindleberger four years ago, and which is rapidly being developed into a recreational center. It has tennis and horse-shoe courts, gardens, toboggan slides, etc., serving as an all-year-around playground.

During the winter, basketball teams are organized within mill departments and in the summer the same teams play soft-ball or regulation baseball. The usual gymnasium facilities are available. An unusual feature is the constant attendance of a male nurse who not only treats minor injuries occurring in the mill, but who gives baths, exercises, light treatments, etc., to any one desiring them, the idea being to keep people well as well as to minister to them after they get sick.

A great deal of musical talent exists among the thirteen hundred employees. There are vocalists, instrumentalists, vaudeville performers, etc. About once every two years a minstrel show is put on, usually showing to packed houses for several nights. One of the unique combinations is the Harmonica Band composed of a dozen or more players who usually appear in overalls and straw hats. The mill has a fifty-piece band which gives concerts both winter and summer, the latter from a portable stage in Kindleberger Park set up on the baseball infield. Summer concerts are often attended by four to seven thousand people. Plans for the coming summer include some form of outdoor dramatics.

It is easy to understand the happiness and contentment that abides in the lives of these fortunate people. All of the comforts, conveniences of living and privileges for entertainment and education are provided by the management not merely because it is thought to be the right thing to do, but because it has been proved to be good business. Contentment of its employees is one of a company's largest assets, although a wholly intangible one. But it would be difficult to prove that the plan followed by KVP has *not* had something to do with the company's good fortune in being able to run full time during the strenuous period from which business is now emerging.

KVP is just as much interested in providing a model community as it is in having a model paper mill.

Confidence Expressed at Annual Meeting of A. P. & P. A.

THE fifty-eighth annual convention of the American Paper and Pulp Association and affiliated organizations at the Waldorf-Astoria Hotel, New York, on February 18-22, will go down in the annals of the industry as one of the most reserved and yet most enthusiastic of all the long string of yearly gatherings of paper manufacturers. After a year's operations under NRA codes, paper mill executives flocked to New York with the primary purpose in mind of obtaining helpful information relative to what to expect of the future in connection with the national recovery program and of sounding out their fellow manufacturers as to their experiences and anticipations under the code set-up. Therefore, something of a serious atmosphere pervaded the convention, yet failed to dampen in the least the spirit of mirth and comradery always in such evidence at gatherings of paper manufacturers.

The time selected for the A. P. & P. A. yearly get-together was very opportune. While the convention was in session two of the most important developments in a long time occurred in the nation's capital at Washington. On the opening day of the convention in New York, the United States Supreme Court announced its decisions in the famous gold clause cases, and on the third day of the convention, President Roosevelt made public his recommendations sent to Congress regarding the future of the NRA. Thus, paper manufacturers assembled in New York were afforded an opportunity for group consideration of these two momentous matters and their likely influence on industry.

In point of attendance, the convention was the most successful in some years. There was a larger total number of paper manufacturers and merchants on hand than has graced a similar event in at least six years, and it is safe to state that the attendance came close to establishing a new high record. There were paper mill executives, salesmen, purchasing agents, technicians and other officials from many sections of the United States, and some from Canada. Scarcely a paper or pulp mill on the Continent failed to be represented at the gathering. The spacious lobbies, corridors and meeting salons of the Waldorf-Astoria were crowded throughout the four-day gathering. Even when the meetings were in session, there were ample convention attendants left to keep things humming in the lobbies and corridors.

On all sides were heard expressions of confidence from paper mill executives relative to present business conditions and the outlook. A consensus of opinion among the horde of conventionites was that the paper industry has made marked strides in working its way out of the depression, and that prospects are exceedingly favorable for continued progress in this direction.

At the annual meeting of the Board of Governors and Executive Committee of the A. P. & P. A., held in the Jansen Suite of the Waldorf on the final day of the convention, F. J. Sensenbrenner, president of the Kimberly-Clark Corporation, Neenah, Wis., was elected president of the American Paper and Pulp Association for the ensuing year.

F. J. Sensenbrenner, newly elected president of the Association

Mr. Sensenbrenner succeeds Sidney L. Willson, president of the American Writing Paper Company, Inc., Holyoke, Mass., who resigned from the presidency of the Association after serving the industry in that capacity for six years —the longest term of any previous A. P. & P. A. president.

The following vice presidents of the Association were elected:

First Vice President, Norman W. Wilson, vice president of the Hammermill Paper Company, Erie, Pa.

Sidney L. Willson, president of the American Writing Paper Company, Inc., Holyoke, Mass.

John R. Miller, vice president of the West Virginia Pulp and Paper Company, New York City.

Hugh J. Chisholm, president of the Oxford Paper Company, New York City.

Stuart B. Copeland, vice president of the Eastern Manufacturing Company, Bangor, Me.

H. W. Ellerson, president of the Albemarle Paper Mfg. Company, Richmond, Va.

D. Clark Everest, vice president of the Marathon Paper Mills Company, Rothschild, Wis.

A. R. Graustein, president of the International Paper Company, New York City.

John L. Riegel, executive vice president of the Riegel Paper Corporation, New York City.

J. D. Zellerbach, executive vice president of the Crown-Zellerbach Corporation, San Francisco, Cal.

Retiring President Sidney L. Willson sounded the keynote of the convention deliberations in addresses before both the National Paper Trade Association on the opening day of the convention and the Salesmen's Association on the following day; namely, that increased production costs brought about by higher raw material, labor and supplies costs must lead to advanced market prices for the various grades of finished paper.

"We need better prices for our commodities," stated Mr. Willson. "While the NRA and the codes have done much for our industry as a whole, every mill has suffered because the extra costs, through compliance with code provisions, have not been equalled by increases in prices. Illustrative of this, take the actual figures of one company, where raw materials, labor and supplies—covering the same tonnage—have actually increased $480,580, while the increase in sales volume on equal tonnage, as compared between 1934 over 1933, amounted to $227,540, leaving as a net additional cost $253,040, which depletes surplus to that extent.

"If you hear rumors of advancing prices, don't be surprised or alarmed, and my advice is, if advances are made, accept them cheerfully, unless you want to see a lot of mills closed, with a result of still higher prices.

"I do not profess to be an economist, but my business experience of fifty years or more has given me an opportunity to absorb some horse sense and to apply it to business problems. We have gone through a period of distress. Distress compels us to think, and to think of the rights of others as well as our own. These conditions have brought the members of our industry together, and the NRA and our codes have further developed a consciousness of the benefits of co-operative efforts. As a result suspicion has been supplanted by confidence. Fear has been supplanted with courage, and prejudice has been supplanted with logic and common sense.

"During the past two years many governmental activities have been inaugurated—some excellent; some good, and some not so good. The paper industry is at present operating under codes. I believe there are no codes in existence from which better results have been obtained. None are perfect. Ours do not meet all the conditions

but they have certainly accomplished a great deal for the industry. It is my belief that where the codes have been found beneficial the provisions will be continued beyond the termination of the present Emergency Act, but even if terminated, I believe the benefits derived from compliance with the provisions of our code have been so thoroughly proven that a voluntary continuance of them would be endorsed by a large majority of the industry.

"The middle of 1932 was the nadir of the depression. Since then improvement has been shown, notwithstanding the occasional ups and downs that have occurred. 1933 was a better year than 1932 by about 15 per cent, and 1934 showed a further improvement over 1933, so I can definitely state that general business conditions today throughout the country are better than the low point in 1932 by about 25 per cent. Statistics for the paper business for the first six weeks of 1935 indicate a further upward trend, and my prediction is that the upward trend will continue. I am not depending upon artificial stimulants, nor pump priming, but upon natural causes; maybe a new type of industry, maybe that old law of supply and demand."

Edwin Sutermeister Awarded T.A.P.P.I. Medal

EDWIN Sutermeister, chief chemist of the S. D. Warren Company, Cumberland Mills, Maine, has the honor of being the fourth individual to receive the T.A.P.P.I. medal. Previous medals were awarded to Ogden Minton, Greenwich, Conn., inventor of the vacuum pulp and paper dryer; William H. Mason, Laurel, Miss., inventor of the Masonite Process; and Ernst Mahler, vice president, Kimberly-Clark Corp., founder of the Institute of Pulp and Paper Industry, as well as inventor of a number of kinds of papers and processes.

Mr. Sutermeister was born in Milton, Mass., and was graduated from the Massachusetts Institute of Technology in 1899. Since that time he has been with S. D. Warren Company, with the exception of the years 1907 to 1910, during which time he was employed as a chemist in the U. S. Forest Service in Washington, D. C., and Madison, Wis.

Mr. Sutermeister has taken an active part in the activities of the Technical Association of the Pulp and Paper Industry and at one time was chairman of its Soda Pulping Committee and at another time, chairman of the Coated Paper Committee. He was the originator of the pebble mill test for evaluating paper pulp. The great improvement in wood pulp during the past twenty years may be largely attributed to the testing work done by consumers of pulp. His other particular technical interests include the development and introduction of domestic clays for loading and coating of paper, the development of starches and gums for coated paper work, improvements in soda pulping and size manufacture and application.

Mr. Sutermeister's favorite hobby is stamp collecting and hiking, particularly in woody country.

Bibliography

Mr. Sutermeister is probably most widely known as the author of *The Chemistry of Pulp and Paper Making*, a book published by John Wiley & Company, which has run into two large editions. He is also the author of one of the American Chemical Society Monographs, *Casein and Its Industrial Applications*. Following is a list of published articles by Mr. Sutermeister:

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- Review of the Literature of Sizing (July 27, Nov. 23 and 30, 1933; Jan. 4, 1934).

Papier Fabrikant
- Observations on Bleaching Soda and Sulphite Fibers (July 21, 1914).

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- Absorption of Alumina by Fibers (Dec. 15, 1913).
- Casein—Its Preparation and Testing for Coated Paper Work (Mar. 1, 1914).
- Decay of Pulpwood and Its Effect in the Soda Process (July 14, 1921).
- Determination of Sulphur in Paper (Nov. 1, 1917).
- Length of Some Paper Making Fibers, The (Jan. 15, 1914).
- Microscope in Paper Making, The (Sept. 15, 1915).
- Notes on Richter's Method for Determining the Bleaching Qualities of Sulphite Fibers (Feb. 1, 1915).
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- Relationship of Paper and Moisture, The (Dec. 1, 1914).
- Testing Sulphite Pulp for Moisture (Nov. 15, 1913).
- Use and Care of the Microscope (Nov. 15, 1915).
- Use of Rotten and Stained Wood for Making Sulphite (June 22, 1922).
- Wet Machine as a Washing Device, The (Sept. 1, 1916).

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- Contribution on Microscopic Work, Volume V.

Technical Association Holds Twentieth Annual Meeting

THE twentieth annual meeting of the Technical Association of the Pulp and Paper Industry, held February 18-21 at the Waldorf-Astoria Hotel, New York City, will doubtlessly go down in the annals of the organization as the most successful convention of the association that has yet been held. The attendance was large. Actual registration approximated 500 delegates. These delegates represented pulp and paper mills and affiliated or allied organizations from all parts of this country and from several foreign countries, including Canada, Sweden and Finland.

Never before, it is believed, was such an extensive program presented; nor was there ever greater manifestation of interest in the proceedings.

The convention was called to order in general session by C. C. Heritage, president of the association and Manager of Coating Division of the Oxford Paper Co., Rumford, Me. Scheduled for this general meeting was the Secretary's Report by R. G. Macdonald, the President's Address by C. C. Heritage, the appointment of nominating committee, and the Report of Joint Textbook Committee.

In the report of the secretary, Mr. Macdonald referred to the year 1934 as a recovery year for the Technical Association and stated that the gain in membership was brought about by the return of many who had found it necessary to drop out temporarily for financial reasons. The number of members elected during 1934 was given as 135, the number resigned or dropped from membership, 63. The total individual membership on December 31, 1934, was said to be 1,127 while the corporate membership was 66 and the contributing membership, 48.

In continuing his remarks, Mr. Macdonald emphasized the special reports issued by the association during 1934. They totalled 28 reports and covered a very wide scope of subject material. The employment service of the association was explained; and mention was made of the successful fall meeting last year at Portland, Ore.

Then the publication activities of the association were touched upon. Reference was made to the Annual Bibliography and Patent List prepared by Dr. C. J. West of the National Research Council, the Yearbook for 1934, the loose-leaf manual of T.A.P.P.I. Standards, Bulletin No. 168 on Vocational Training in the Pulp and Paper Industry, and the text books on the *Manufacture of Pulp and Paper*. It was stated that the text books on the *Manufacture of Pulp and Paper* will be revised this year by T.A.P.P.I. and the Canadian Technical Section and issued as third revision by the McGraw-Hill Book Company.

Co-operative and sectional activities of the association came in for some comment after which the function of the T.A.P.P.I. Council and Planning Committee was explained. By way of explanation, it was stated that these organizations meet for the purpose of definitely planning the annual and fall meetings and to discuss the general welfare of the association. Personnel changes in the divisional and committee chairmanships and the organization of several additional committees were then covered in detail by Mr. Macdonald. This presentation completed his report.

Mr. Macdonald's report was followed with a report of the Joint Textbook Committee by R. S. Kellogg of the Newsprint Service Bureau, and the reports of the standing committees as well as with brief remarks by W. S. Kidd, Chairman of the Canadian Technical Section and M. A. Krimmel of the Hammermill organization and past president of T.A.P.P.I.

President Heritage Addresses the Association

With the appointment of a nominating committee Mr. Heritage proceeded with his address. He mentioned the growth in membership of the association from a handful of charter members to a body of 1,200 members; stated that the association is now about to become of age; told of the conditions in the industry under the code during the year just past; and suggested that the general result of these happenings under the code so far as the individual technical man is concerned, is that his activities though no less strenuous and exacting, have perhaps become more orderly, less hectic and less chaotic when compared to 1933. Cost of manufacture was also touched upon and it was stated that profit is now more than ever dependent upon the cost of production. The financial condition of the association was said to be sound; the work of the various committees was commended; and the need for more intensive co-operation with research and educational institutions which deal particularly with the subjects of fibrous raw materials, pulps, papers and paper products was cited. In this last instance, the work of the University of Maine, Massachusetts Institute of Technology, New York State College of Forestry, Pulp and Paper Laboratory of the Industrial Committee of Savannah, Bureau of Standards, University of Michigan, Institute of Paper Chemistry, Forest Products Laboratory, University of Idaho, University of Washington, Columbia University, and the University of Alabama was mentioned briefly and individually. Publication activities of the association were commended and reference was made to the expectation of publishing the first T.A.P.P.I. monograph during 1935 on *The Relation of Fiber Properties to Sheet Properties*.

In concluding his remarks, Mr. Heritage complimented the Pacific Section of T.A.P.P.I., which was host to the association at its 1934 fall meeting, and hinted that the fall meeting in 1935 would probably be held at Atlantic City, the Delaware Valley Section of T.A.P.P.I. being the host.

Following the appointment of a nominating committee and the report of the joint textbook committee, the general session was adjourned and three separate meetings convened almost immediately. One of these meetings was a Management Meeting over which W. M. Shoemaker presided as chairman; another was a Pulp Testing Meeting with R. C. Griffin and H. W. Morgan, Chairman; and the third, presided over by J. J. O'Connor, was a Coated Paper Meeting.

Management Group Meets

Three papers were presented before the Management Meeting group. The first of these papers was on the subject of *Chart for Executive Control During Time of Shifting Economy*. It was presented by W. N. Polakov, well-known industrial engineer.

J. O. Hagenauer, secretary of the labor committee, American Paper and Pulp Association followed Mr. Polakov with his paper on *Labor Cost of Production in the Paper and Pulp Industry*. Mr. Hagenauer pointed out that 63 per cent of the mills manufacturing products that fall under the general code of fair competition for the paper and pulp industry are located in towns of less than 10,000 inhabitants and that 90 per cent are in towns and cities under 100,000; that employment in the industry declined steadily from May, 1929, to May, 1933, and since that time there has been a considerable increase; and that wages may be divided into three distinct groupings. In explaining this grouping, Mr. Hagenauer said that wages in the northern regions and in the Pacific Coast states average at approximately the same levels while those in the states below the Mason and Dixon line and north of the northern border of the Gulf Coast states average much lower and those in the Gulf Coast states tend to be lower still.

The average weekly earnings of skilled and semi-skilled workers in the pulp and paper industry, however, said Mr. Hagenauer, have been consistently higher than those of workers in other industries since the earliest records of the National Industrial Conference Board, up to 1931, when the paper industry wages increased to still higher levels. These earnings were stated to be due chiefly to greater stability and infrequency of lay-offs rather than higher hourly rates.

The post-code period was then analyzed, and it was indicated that man-hours per ton are much greater in small mills than in large mills but the number of tons produced per employee is much greater in the case of the large mills. It was further pointed out that cost of production is considerably higher in small mills than in large mills. He further commented that increased labor costs have been met by the industry without proportionate increase in paper prices.

This paper by Mr. Hagenauer was well illustrated with tables and graphs which covered hourly and weekly wages, average hours of work, wage rates by occupations and regions, labor cost per ton of paper by wage rate zones, and numerous other data.

The third paper of this Management Meeting was presented by H. G. Noyes of the Oxford Paper Company. It was entitled *Apprenticeship in the Paper Industry and the N.R.A.* Mr. Noyes called attention to the regulations set forth in President Roosevelt's executive order No. 6750-C which provided that persons may be employed as apprentices at wages lower than the minimum established in N.R.A. codes if certain provisions are complied with by their employers. He told of the federal and state activities that have been started as a result of this order and reiterated a statement made by William F. Patterson, Executive Secretary, Federal Committee on Apprentice Training that the man or woman who has a broad preparation is usually the last one to be laid off in periods of slack business. Mr. Noyes then outlined suggestive steps to be taken in setting up an apprenticeship program for the industry and suggested that if careful study of the whole apprenticeship program is made, the pulp and paper industry may find it a useful training agency for obtaining workers in skilled and key positions in many occupations.

Pulp Testing Meeting

One of two papers presented before the Pulp Testing Meeting by R. S. Hatch, Director of Research of the Weyerhaeuser Timber Co., Longview, Wash., was a joint contribution of C. W. Morden of Morden Machines Co., Portland, Ore., and George H. McGregor of Weyerhaeuser Timber Co. This paper was entitled *The Stock-Maker Precision Laboratory Beater* and in it not only was the beater described but results that have been obtained with it were commented upon. It was pointed out that this laboratory unit permits two distinct ways of handling the stock—one is the continuous batching type operation similar to that in commercial heaters of this type while the other is a dual type continuous circulation treatment in which the entire amount of stock to be treated is put in the machine at one time and all of it is recirculated during its period of treatment. The dual type continuous circulation treatment was said to have advantages for laboratory work. It was also stated that the two outstanding facts in regard to the use of this unit were the short time required to prepare the stock and the accuracy with which the strength and freeness development of tub type laboratory equipment are duplicated.

The second paper before this Pulp Testing Meeting covered The *Kollergang Beating Method for Pulp Evaluation* and was presented by James d'A. Clark, Technical Director, Scott Paper Co., Chester, Pa. Literature citations to descriptions of various laboratory beating apparatus were made by Dr. Clark. Then he defined a precision beating apparatus as one which progressively bruises the fibers in a mixture of pulp and water in a positive, definite, and reproducible manner; told of his experiments in the development of a laboratory kollergang; and stated that probably the most satisfactory feature of the equipment is its ability to duplicate its action on pulp irrespective of the quantity in the tub, within certain wide limits, provided the consistency and the number of revolutions per gram of pulp treated are constant.

The apparatus was described as consisting of an annular V-shaped trough in which three runners, having a fixed weight of 80 kilograms, are caused to rotate positively; and of propellers between the runners to keep the stock well separated during treatment. The kollergang was stated to hold up to 150 grams of pulp and to handle most pulps up to a consistency of 5 per cent.

Following the description of the apparatus, Dr. Clark presented in detail a suggested method for obtaining enough points to construct beating curves of the various physical properties of pulps including the drainage time. The Calibration of the apparatus was described and the results of varying the weight, temperature and speed of rotation of the rolls and propellers and other factors discussed. Beating results were also given for a number of different pulps including rag and rope.

Coated Paper Meeting

The papers presented before the Coated Paper Meeting included *Surface Application of Titanium Pigments* by W. R. Willets, Paper Development Laboratory, Titanium Pigment Co., Inc., Brooklyn, N. Y., *Testing and Classification of Coated Paper* by H. M. Annis, Chief Chemist, Allied Paper Mills, Kalamazoo, Mich., and *Washable Wall Paper* by Robert Voit.

In preparing a suspension of titanium pigments in a starch surface size solution, Mr. Willets said, care must be taken that the pigment is first made into a thoroughly uniform and well suspended water slurry. Then this slurry can be intimately mixed with a well cooked starch solution. A method developed by his company for the preparation of such a suspension was described briefly, following which its methods of application were given. Among the methods mentioned were size tub; calender stack; spraying on machine wire, dandy roll, between the couch and press, between the presses, or at any other convenient point; and the substitution of the last press as a sizing apparatus. Results of the surface application of titanium pigments were given, and it was stated that one of the most inspiring fields for the use of a size pigmented with titanium pigment is for the manufacture of offset papers. Similarly, titanium pigments were said to be used in surface application to improve the opacity and color of catalogue, magazine and groundwood book papers; and on board where they tend to improve the general appearance and surface and to prevent filler from showing through.

The paper by Mr. Annis on Testing and Classification of Coated Papers touched upon the efforts during the past year of the Finished Product Subcommittee of the T.A.P.P.I. Coating Committee in the tabulation of standard practices of various coating mills and in coated paper grading specifications. Mullen, Elmendorf, filler content, and sizing were stated to be the usual routine tests of coating raw stock. Tests for formation, brightness, porosity, fold, and finish were said to be less generally used as was also the wax test. Routine tests on finished coated papers, however, included the wax test together with Mullen, burst, tear, Ingersoll finish, fold, and, in some cases, such tests as brightness, stiffness, Bekk smoothness and ink or oil, receptively, are used. In special papers, in conjunction with the more usual tests, are made tests of pH value, varnishing qualities, curling tendency and opacity. Methods and instruments for making some of these tests were touched upon very briefly as was the subject of semi-coated papers—papers carrying a very light coating film which is usually applied in conjunction with paper machine operation.

Coated paper quality trends and grading specifications also came up for consideration. The outstanding quality trend, it was said, may be considered to be the reduction in quality difference between the top and bottom grades and the remarkable similarity of the leading papers in a given grade.

The paper of Robert Voit on Washable Wall Paper was read by O. W. Callighan of Edgar Brothers Company, New York City, and it was followed by a resumé of the Paper Coating Committee and Subcommittee reports. This resumé was presented by Harold Raffton of Raffold Laboratories, Inc., Andover, Mass.

Monday Afternoon Sessions

The afternoon sessions of the first day included a Management, an Acid Pulping (Sulphite), and a Paper Testing meeting. H. H. Hanson was chairman of the Management meeting; while P. A. Paulson, W. H. Swanson and W. T. Webster were chairmen of the Acid Pulping (Sulphite) meeting, and R. C. Griffin and B. W. Scribner of the Paper Testing meeting.

Management Meeting Symposium

Adam Wilkinson was the first speaker in the afternoon session of the Manage-

ment meeting. His subject was *The N.R.A. and Its Effect on Labor Relations in the Paper Industry*. After reviewing briefly the history of trade unionism, Mr. Wilkinson stated that the rank and file of labor are impatient with the present day trade union movement. He said that many wise labor leaders are aware of conditions; suggested that there were many differences of opinion; and made reference to reforms to labor through political rather than economic processes. It was brought out that there was a vast difference in reducing the hours of labor from 48 to 40 than from 40 to 30; but questioned—is it not a fact that we are developing to a point where we shall have some definite governmental labor policy. The articles by General Johnson which have been appearing in the Saturday Evening Post were cited and were said to be well worth reading.

In the opinion of Mr. Wilkinson the paper industry has been more than fortunate. He stated that there has been no serious conflict over Section 7A; that the trade unions in the paper industry were headed by men who have a broad and deep understanding of the economics underlying the industry; and that there must be recognition of the fact that labor relationship as known in the past is undergoing changes which must be met with compromise.

He mentioned that most labor difficulties in the past had arisen in non-union plants; and that there had been no strike during the N.R.A. in any of the paper mills in his territory. Time spent in the conference room, said Mr. Wilkinson, is much better than time spent in settling strikes.

Mr. Wilkinson expressed no fear for the outcome of the present labor situation. Out of it, he said, would come a labor policy that would prove satisfactory to both labor and management.

In the discussion which followed Mr. Wilkinson's address it was brought out that the skilled worker in industry is conservative; that the union tendency in the paper industry is toward a semi-vertical structure; that only a small percentage of paper mill workers in the industry are unionized—the total number not exceeding 20,000-25,000; that the closed shop may be desirable as a matter of expediency; and that as a matter of principle the trade union rests on voluntary association.

The second and last paper presented before the Management Meeting was entitled *Paper and Pulp Mill Management in the Pacific Northwest under the N.R.A.* It was the subject of R. B. Wolf of the Weyerhaeuser Timber Co., Pulp Divison, Longview, Wash., and was read by R. S. Hatch of the same organization. In this paper was outlined the unionization of mills in the Pacific Northwest. Most of them were said to be unionized by August, 1933. Reference was made to a convention called at Vancouver, Wash., and to a later three-day session at Portland, Ore., at which meeting an agreement was reached by the locals and mills participating. This agreement, it was said, has worked well since August, 1934.

Reference was also made to the labor movement in Australia, where it is understood that the labor problem which has been most acute for a number of years has been practically solved. The recommendation of an Australian visitor to the West Coast, resulting from this experience, was quoted. It was a recommendation that the employer deal directly with the union so that the union would not have to go into politics for recognition.

A typical labor grievance and method of handling it was then related; and a statement made relative to the change in the United States from an agricultural to an industrial nation. In conclusion, Mr. Wolf called attention to the fact that we have been trying industrial self-government for a very short time.

It was brought out in the discussion following the reading of Mr. Wolf's paper that the agreement to which reference had been made referred to practically all of the mills on the West Coast; that a uniform wage scale prevailed; that some of the mills have four shifts and some three with an extra shift to fill in; and that any difference of opinion relating to qualification of worker for certain rating was settled periodically in meetings with the union committee.

An objection was raised to the use of the term "company union" and "employee representation" was suggested in place of it. The latter term, it was expressed, would inspire an attitude of co-operation on the part of the individual. It was further suggested that the Management Committee of T.A.P.P.I. might well undertake a study covering the philosophy and principles of trade unionism as well as the history of employer and employee relations and the trend from craft to industrial unionism. A study of the labor situation in Australia, Sweden, and other countries was likewise recommended.

Acid Pulping (Sulphite) Meeting

The Acid Pulping (Sulphite) meeting included a schedule of five papers—Acid Pulping Developments by P. A. Paulson, Consultant, Appleton, Wis., Steam Used for Sulphite Pulping by O. L. Berger, G. D. Jenssen Co., New York City; A Study of Some Factors Influencing the Formation of Sulphur Trioxide in Sulphur Burner Gases for Sulphite Pulping by B. L. Browning and Dr. Otto Kress, Institute of Paper Chemistry, Appleton, Wis.; A Mill Test for the Exact Determination of Combined Sulphur Dioxide by G. V. Palmrose, Weyerhaeuser Timber Co., Longview, Wash.; and Analyzing Sulphite Mill Problems by O. E. Anderson, International Paper Co., Chisholm, Me.

Report of Acid Pulping Committee

The paper by Mr. Paulson on *Acid Pulping Developments* constituted a report of the Acid Pulping Committee and within it were mentioned several outstanding developments made in the sulphite pulp industry during 1934.

There was mention of a development by R. B. Wolf for use in acid making which consists of a fortifying tower for installation in connection with the regular towers. This tower operates at pressures up to 20 pounds, if necessary, and is supplied with system acid from the regular towers and burner gas through an acid resisting alloy compressor. The same principle, when applied to a milk-of-lime system, makes it possible to utilize the acid tower itself as the pressure unit.

Mention was also made of the spray burning of sulphur. The advantages cited for this method of burning included quick starting and stopping, and high gas concentration.

Another innovation for the improvement of acid plant operation, known as the Ellis-Burns compound air preheater for sulphur burners, was described as a simple arrangement whereby the air entering the burner is preheated by waste heat from the burner itself and from the combustion chamber. Uniform temperature of burner gases and SO_2 strength of 18 to 19 per cent with freedom from sublimation and a minimum of SO_3 were given as the advantages claimed for the development.

Reference was also made to the Hellstrom system of forced circulation for use in connection with the digestion process. This system, unlike those of Babcock & Wilcox Company and Fibre Making Processes, Inc., employs no indirect heaters nor are liquor strainers used. The pump used is capable of handling both chips and liquor and circulation takes place from the bottom of the digester to the top.

Mr. Paulson likewise called attention to a circulation experiment that is being carried on in one of the mills on the Pacific Coast. The idea is unique as no power driven medium is used for creating forced circulation. The so-called dry gas from the top of the digester is passed through a heat exchanger where it is liquefied and runs by gravity back to the digester where, striking the hot liquid, it again vaporizes and thereby creates a disturbance or agitation of the digester mass.

It was also stated that most mills seemed convinced that the best all around material for withstanding the cooking liquor and gas is chrome-nickel steel of the KA4 type, 18 per cent chrome, 8 per cent nickel and 3 per cent molybdenum; that the introduction of the Dunbar drive to flat pulp screens had been of interest; that chromium plated screen plates continue to gain in favor; and that the various two-stage processes continue to hold the center of the stage in connection with bleaching.

A new first stage bleaching process, the Westvaco hypochlorous acid method, was briefly described. This process was said to differ from the others in that hypochlorous acid made by passing chlorine water over limestone is used as the first stage bleaching agent rather than chlorine water.

Suggestions for problems that should be given attention were also made by Mr. Paulson in his presentation of the

committee report. They included such problems as the effect of various bases on quality of pulp produced for various uses; the effect of air and other inert gases on penetration of the sulphite liquor into the wood; the effect of return liquor on quality of pulp produced; and the effect of pulp of various characteristics on the sizing of paper.

Steam for Sulphite Pulping

Mr. Berger in his paper *Steam Used for Sulphite Pulping* reported the activity of the subcommittee of the Heat and Power Committee of T.A.P.P.I. on the Utilization of Heat in Chemical Processes. Information obtained as a result of this activity covered steam requirements in fifteen reresentative mills of which six are using the Chemipulp process, one forced circulation with indirect heating and eight using the ordinary Ritter-Kellner method without heat recovery.

The Chemipulp mills reported steam figures from 4,200 to 5,400 pounds per ton with an average of 4,600 pounds. The mill using forced circulation reported 4,800 pounds, while the Ritter-Kellner mills showed variations from 5,290 to 9,350 pounds and averaged 7,200 pounds.

The mill reporting the least steam consumption was stated to use a much stronger acid than any of the other mills. It was an acid with a total of 8.50 per cent and a free of 7 per cent. The other mills reported an acid which varied from 4.50 per cent total with 3.30 per cent free to 5.80 per cent total and 4.75 per cent free with an average of 1.15 per cent combined.

Eleven of the mills reported the use of superheated steam—the superheat varying from 20 to 110 deg. Fahr. and averaging 55 deg. Fahr. The digester temperatures varied from 137 to 160 deg. C. and averaged 148 deg. C. The pressures varied from 65 to 90 pounds and averaged 75 pounds. The digester blow pressures varied from 24 to 60 pounds and averaged 39 pounds—the mill reporting the smallest steam consumption blowing with the least pressure.

Temperature of the acid entering a digester varied from 25 to 80 deg. C., the mill using the most steam for cooking using the coldest acid.

The quantity of acid per ton varied from 2,250 to 3,420 gallons. One Chemipulp mill reported the use of 1,350 gallons of raw acid and 900 gallons of reclaimed acid or a total of 2,250 gallons per ton.

Sulphur Trioxide in Sulphur Burner Gases

Results of an investigation covering the formation of sulphur trioxide in sulphur burner gases from the standpoint of the operation of a Texas Gulf Sulphur spray burner, was covered by B. L. Browning and Dr. Otto Kress in their paper entitled *A Study of Some Factors Influencing the Formation and Dissociation of Sulphur Trioxide in Sulphur Burner Gases for Sulphite Pulping.* It was stated in this paper that sulphur trioxide in sulphur burner gases may come from the decomposition of sulphuric acid present in the sulphur, from formation during actual burning of sulphur, and from oxidation of the sulphur dioxide in the burner gases. The last mentioned source, it was suggested, must account for a considerable portion of the trioxide found in burner gases.

After describing in detail the experimental set-up and method of analysis used in the investigation, a number of conclusions were drawn. Among these conclusions were the following:

"Irrespective of the materials of which the sulphur burner and heat exchanger are constructed, an increase in sulphur dioxide content of the burner gases leads to a decreased sulphur trioxide formation.

"The high temperature of 2400 deg. Fahr. and the high concentration of sulphur dioxide prevailing in the spray type sulphur burners, limits the maximum amount of sulphur trioxide which can be formed to a value lower than the sulphur trioxide content of burner gases often obtained with conventional type sulphur burners.

"A burner lined with refractory brick will produce burner gases of lower sulphur trioxide content than the conventional type of iron burner."

Test to Determine Combined Sulphur Dioxide

The paper *A Mill Test for the Exact Determination of Combined Sulphur Dioxide* by G. V. Palmrose described a method for determining the combined sulphur dioxide through the use of potassium iodate in the presence of iodide ion. The procedure for making a test, in brief, was as follows: To a 250 cc. Erlenmeyer flask add 75 cc. of distilled water followed by the addition of 2 to 4 drops of methyl red indicator solution and 2 cc. of starch-potassium iodide solution. *The solution should be orange or yellow at this point.* Then pipette 2.00 cc. of the sample to the flask and titrate with N/8 potassium iodate solution. *Avoid shaking the flask until color begins to appear. The per cent total is 0.2 times the cc. of N/8 potassium iodate.*

If the sample contains no lignin derivatives, add one drop of N/8 (3 per cent) sodium thiosulphate solution to decolorize the blue of starch; if they are present, proceed with the caustic titration without decolorizing.

Titrate the contents of the flask with N/8 sodium hydroxide solution. Stop at the point at which one drop turns the solution an orange or yellow. The apparent per cent free is 0.2 times the cc. of N/8 sodium hydroxide. If the sample contains lignin derivatives, add 2 cc. of approximately N/1 sulphuric acid and again titrate with N/8 potassium iodate. That part of the free titration due to reversible sulphur dioxide is for practical purposes, 0.1 times the cc. of N/8 potassium iodate. This is subtracted from the apparent per cent free for the correct value. The combined is obtained by the difference.

The preparation of the solution for use in this testing method was also explained, and the advantages and disadvantages of the method cited. It was stated that the cost of the potassium iodate was about 10 per cent of the cost of iodine; that potassium iodate cannot be used for hot tests without the addition of a little sulphuric acid; that the method does not work well toward the end of the cook but that on liquors with a moderate amount of lignin derivatives it repeatedly checks the combined as determined from the lime content of the liquor.

Problems in the Sulphite Mill

Analyzing Sulphite Mill Problems by O. E. Anderson was the last paper scheduled before the Acid Pulping (Sulphite) Meeting. This paper dealt with evaluation of commercial variables in sulphite pulping and offered methods and suggestions for analyzing sulphite mill problems.

Each day in the chipper room of the mill with which Mr. Anderson is associated it was stated that tests were made on a composite chip sample for chip uniformity, moisture content, per cent slivers, per cent knots, per cent rot, specific gravity, and per cent chipper waste. It was also suggested that a 1 per cent solubility test was made on a weekly composite sample to obtain an indication of the amount of decay in the wood. The amount of chipper waste was said to be reduced by 1½ per cent of the wood consumed through a reduction in chipper speed from 300 to 200 r.p.m., and often by as much as 0.55 per cent by more frequent changing of knives.

Strength, color, and cleanliness were mentioned as factors in pulp quality. Pulp strength was stated to vary greatly with the kind and condition of the wood, type of temperature curve, cooking time, method of cooking, etc., but that, in general, it increased with better wood quality, more complete penetration, lower maximum temperature and longer cooking time. Penetration of acid was said to have a very important effect on all three factors.

It was brought out that with poor wood the tons of wood per digester and the yield were lower while the per cent lignin, caustic solubility and waste at the chippers and screens were higher. Fiber losses at blow pits and rejections from knot and tailing screen were also pointed out as possible causes of low yields.

The principal losses of sulphur, which might amount to from 10 to 50 or more pounds per ton of pulp, were said to occur in the form of SO_3 in the acid plant, loss of SO_2 out of the absorption system, acid and gas leaks, and SO_2 in the blow liquor; while the largest factor in sulphur consumption was stated usually to be the actual sulphur requirements of the wood.

The mill of tomorrow, in the words of Mr. Anderson, will have more measuring and controlling instruments and devices so that the proportion of time that we will be "flying blind" will become less and less.

Paper Testing Meeting

Among the papers scheduled for presentation before the Paper Testing meeting were: *The Determination of Rigidity, Stiffness and Softness of Paper*, by James d'A. Clark, Scott Paper Co., Chester, Pa.; *Evaluation of Printing Qualities of Paper*, by B. L. Wehmhoff, W. F. Hall Printing Co., Chicago; *The Testing of News Print for Smoothness, Ink Penetration and Opacity*, by W. G. Dodge and C. E. Tarvin, both of the News Syndicate Co., New York City; *Certified Stains for Fiber Differentiation*, by J. B. Calkin, Cornell University, Ithaca, N. Y.; and *New Stains and Their Use for Fiber Identification*, by J. F. Graff, The Institute of Paper Chemistry, Appleton, Wis.

Determining Rigidity, Stiffness and Softness

In the paper by Dr. Clark were reviewed, in brief, various methods for determining the stiffness or flexibility of paper and paper board and a new simple method was presented for the determination of rigidity. These methods, to which literature citations were made, included the cantilever test, beam test, column test, folding test, modified cantilever test, and the pendulum test.

The new method to which reference has already been made consists essentially of determining the overhang of a strip which, when the end is rotated through a right angle, will just fall over in the direction turned, and then applying a given formula. It was stated that results could be reproduced by this test to within 5 per cent.

The instrument developed to make the test was described and detailed information was presented on the necessary procedure to be followed in its use.

Printing Properties

Mr. Wehmhoff's paper on Evaluation of the Printing Quality of Paper constituted the report of the Printing Properties Subcommittee of the T.A.P.P.I. Paper Testing Committee. In this report Mr. Wehmhoff described a number of test methods used in the work of this subcommittee and presented some figures of test results. The test methods employed included an oil absorption test developed to measure the resistance of coated and heavy super printing paper to the penetration of printing inks, and an oil penetration test which is described under "oil drop method" in the subcommittee report published in Technical Association Papers for 1929. In addition, several instruments were used in the work. They included a Bekk tester, thickness tester (a dead weight gauge reading to .0001 inch and conforming to T.A.P.P.I. standards in other details was reported preferable to spring actuated gauge specified in T.A.P.P.I. Standard T411 m), old model Gurley densometer, two contrast ratio opacity testers, and a Westinghouse transometer.

It was recommended in the report that the Paper Testing Committee give serious consideration to the adoption of density, oil penetration, oil absorption, and printing smoothness as tentative T.A.P.P.I. standard tests and to revision of the present standard tests for thickness and opacity.

Testing News Print

It was brought out in the paper by W. G. Dodge and C. E. Tarvin on the Testing of News Print for Smoothness, Ink Penetration and Opacity that the printing quality of newsprint is primarily a function of its smoothness, absorptiveness, and opacity; and that testing instruments had been developed to measure those three properties.

The smoothness tester was said to operate on the principle of frictional resistance and to give readily reproducible readings.

The penetration tester was devised to indicate the degree of ink penetration as a function of time. In this instrument, a beam of light from an optical system is cast upon the part of the sample receiving the ink, and is reflected back upon two photoelectric cells. As ink is absorbed by the paper the reflected light becomes less intense and the current generated by the cells decreases. Readings are taken by measuring the time for the current to drop a predetermined amount.

The opacity instrument was developed to measure the passage of light from a controlled source through the sheet, the amount of light passing through being recorded photoelectrically. This method of testing, said to be admirably suited to checking the show-through tendencies of newsprint, was checked against the contrast ratio method and its readings indicated less transparency in all cases. When the news tester was lined with glossy white paper, however, and readings taken, they were found to agree with readings obtained by the contrast—ratio method. As a result of their work, the contributors of this paper believe that measurements for paper transparency which are influenced by the extent of light diffusion are the more reliable for practical determinations.

Fiber Stains Recommendation

John B. Calkin in his paper Certified Stains for Fiber Differentiation stressed the importance of using standard dyes in the differentiation of papermaking fibers where possible, and in the case of a new stain to provide others trying out the stain with some of the same lot of dye. Stains put on a certification basis by the Committee on Standardization of Biological Stains, a committee of the National Research Council, were listed and a list of manufacturers and standardizers of biological stains given. The importance of certified stains to mills manufacturing deeply colored papers was suggested. It was stated that in such cases the stains would be useful in checking the relative affinity of the dyes for the fibers used, as well as the deportment of their alum-size precipitates when thrown down at beater concentration. Mention was also made of the desirability of T.A.P.P.I. co-operation with the previously mentioned Biological Stain Commission, which is engaged in the standardization of microscopical stains.

New Stains and Fiber Analysis

The paper by J. H. Graff on New Stains and Their Use for Fiber Identification presented a comparative study of old and new stains, and showed how the new stains, namely the "C" stain and the "F" stain, not only differentiate between the coniferous fibers, bast and leaf fibers, and rag and hard-wood fibers, but also between the various classes of the coniferous and hard-wood fibers. The method utilized in the preparation of each stain was given and their color reactions were classified according to Ridgway's Color Standards and Color Nomenclature (A. Hoen and Company, Baltimore, Md., 1912).

Another paper by Mr. Graff on *The Factors Involved in the Accuracy of Fiber Analysis* was scheduled for presentation by title. In this paper were described methods for preparing slides and for counting fibers. The accuracy to be expected from a single analysis was gone into in some detail. In addition, a practical application in determining the uniformity of a fiber furnish across the machine direction of a sheet of paper was made.

Second Day Sessions

The sessions of the second day included a Paper Drying and Fourdrinier Wire Meeting and a Sizing Meeting in the morning, and a Paper Manufacturing Meeting and a continuation of the program of the Sizing Meeting in the afternoon. F. C. Clark, F. C. Ladd, J. D. Miller and A. E. Montgomery were chairmen of the Paper Drying and Fourdrinier Wire Meeting; H. C. Schwalbe of the Sizing Meeting in both morning and afternoon session; and F. C. Clark, F. C. Ladd and H. P. Cannon of the Paper Manufacture Meeting.

Paper Drying and Fourdrinier Wire Meeting

Four papers were scheduled before the paper Drying and Fourdrinier Wire Meeting, namely; *Relation of Fiber Formation and Hygrometric Condition of Paper to Register in Offset Printing*, by C. G. Weber, Bureau of Standards, Washington, D. C.; *Factors Governing Heat Transfer in Paper Drying*, by F. C. Stamm, The Upson Company, Lockport, N. Y.; *Requirements of Materials for Weaving Fourdrinier Wires*, by H. E. Brown, W. S. Tyler Company, Cleveland, Ohio; and *Some Factors Influencing the Life of Fourdrinier Wires*, by F. G. Wheeler, Kimberly-Clark Corporation, and N. B. Pilling and F. L. La Que, both of the International Nickel Company, Inc.

Heat Transfer Factors

The most important variables affecting heat transfer in paper drying, as brought out in Mr. Stamm's paper on Factors Governing Heat Transfer in Paper Drying were said to be the accumulation of air within a dryer and the percentage of moisture in the sheet leaving the wet end of a paper machine. It was brought out that a 6 per cent increase in moisture at the wet end will

cause a 30 per cent increase in the amount of water to be taken out of the sheet and that the moisture content of the sheet leaving the dryers also has a marked effect on drying capacity.

In discussing the effect of steam pressure on drying rate it was stated that the Minton vacuum dryer operates down around 26 to 28 inches of vacuum; that the average news machine operates around 10 pounds steam pressure; that board is dried around 20 to 40 pounds and instances of as high as 150 pounds have been reported; and that as the steam pressure goes up the effectiveness decreases.

It was likewise pointed out that the larger the diameter of the dryer, the better the drying efficiency; that the effect of width on drying seems to have very little if any effect on the drying rate or heat transfer; and that vertical stack drying offered very little increase in drying rate over the regular two or three deck arrangements.

The Materials of Construction Committee sponsored the symposium on fourdrinier wires. This program covered the subject from three angles: the wire weavers', the consumers', and fundamental metallurgical considerations of the requirements of metals for this service.

Wire Material Requirements

Hugh E. Brown of The W. S. Tyler Co. presented the first paper, Requirements of Materials for Weaving Fourdrinier Wires. This was an excellent outline of the properties required in wires to make them suitable for the manufacture of fourdrinier wire and cylinder face wire cloth. He described the latest methods of annealing and showed photomicrographs which illustrated the effect of annealing on grain structure.

In commenting on this paper, W. E. Buchanan of Appleton Wire Works Inc. pointed out that the wire weavers did not generally alloy the metals for wires, but were actually fabricators of standard and new special wires. The alertness of the weavers during the past years has resulted in a steady improvement in the quality of wires of the standard brass and phosphor bronze analyses. Of note is the great improvement in seam formation. As new alloys are proposed for wires, the weavers are eager to determine whether they have merit for this service.

Service Requirements of Wires

Harry G. Specht, of Eastwood-Nealley Corporation, followed by presenting a description of the actual service requirements of fourdrinier wires, in which by the use of slides he pointed out the extreme stresses which are put on the delicate wire fabric as it travels 1000 ft. per min. on the paper machine. His conclusion was that for best results it is almost necessary to have "tailor-made" wires for each machine, in contrast to any tendency towards standardization in wires. Concerning other than the current standard alloys, he stressed the fact that nickel produces hardness in the alloys, and although it has some good properties, this effect eliminates it from consideration. In discussing wire drawing, he pointed out the necessity for uniformity of the wire and freedom from oxide occlusions.

Wire Life

The second paper was the joint paper by F. W. Wheeler, N. B. Pilling and F. L. LaQue, entitled, Some Factors Influencing the Life of Fourdrinier Wires.

Mr. Wheeler's material concerned a novel and practical method of approach whereby the life of a wire in service on an individual machine was related to the hardness of the wire. By using a standard scale of wire hardness as a guide, Mr. Wheeler found that for a specific machine there was an optimum hardness which corresponded to maximum wire life, all else being equal. This of course is based on mechanical characteristics of the machine and again points to the desirability of tailor-made wires.

The portion of the paper prepared by Messrs. Piling and LaQue covered an analytical presentation of the wire problem. Four stresses to which the warp wire is subject during operation were separately analyzed mathematically. This was followed by a discussion on the effect of knuckle wear on bending stresses. An equation was given for bending stress for a straight wire of circular cross section bent to conform to a cylinder of such size that the stresses developed in the wire are below the elastic limit of the material. Likewise the driving tension relation to the linear speed of the wire and the power required to maintain it at that speed was given by equation.

The difference in behavior between hard and soft wires was analyzed, and it was shown that there should be an optimum degree of hardness for warp wires which will provide maximum resistance to wear without sacrifice of the ductility required to provide for overstressing. This fact was demonstrated in practice in Mr. Wheeler's part of the paper.

James E. Kemp of The American Brass Co. in commenting on this paper presented a number of slides and traced the improvement in nonferrous metallurgy as it related to the wire industry during the past twenty years. Slides showing the A.S.T.M. standard grain hardness were also presented.

At the conclusion of this wire symposium the chairman suggested that since the ultimate in wire material has probably not been reached to date, more rapid progress in this direction might be made if a research program were instituted at some such research institution as Mellon Institute for Industrial Research or Battelle Memorial Institute. Full recognition was given to the efforts being exerted on the part of the wire fabricators in this regard, and the necessity for their co-operation in a research project was pointed out.

Sizing Meeting

The schedule for the Sizing Meeting, considering the morning and afternoon sessions together, included eight different papers—*Our Present Knowledge of Rosin*, by E. A. Georgi, Hercules Powder Company, Wilmington, Del.; *Losses in Size Making and Observations in the Cooking of Rosin*, by M. A. Krimmel, Hammermill Paper Co., Erie, Pa.; *What I Do Not Know About Sizing and Capillary Flow*, by Miss R. M. Cobb, Lowe Paper Co., Ridgefield, N. J.; *Solutions of Basic Salts of Aluminum*, by A. W. Thomas, Professor of Chemistry, Columbia University, New York City; *The Fundamentals of the Bewoid Process*, by Bruno Wieger; *Physico-Chemical Principles of the Bennett Process*, by O. F. Neitzke, Bennett, Inc., Cambridge, Mass.; *Special Types of Rosin Size and Their Physical Properties*, by J. A. DeCew, Process Engineers, Mt. Vernon, N. Y.; and *Testing of Non-Fibrous Raw Materials*, by C. E. Peterson, Riegel Paper Corporation, Riegelsville, N. J.

History of Rosin

Mr. Georgi's paper on Our Present Knowledge of Rosin reviewed the history of rosin and naval stores manufacture, discussed the properties of and tests for rosins, and considered the composition of rosin and the nature of some of its salts.

It was stated that the methods used to produce naval stores changed but little from 1700 to 1900; that the gum rosin industry in the past had been handicapped by lack of technical control but that research is showing by adequate control a standard uniform grade of rosin can be produced; and that present day rosins may be best studied by comparing their properties and the tests used to measure these properties.

Color and cleanliness were the properties which were said to immediately strike the prospective user. Melting point and viscosity, vapor pressure, specific heat, latent heat and density also came in for mention, as did the acid and saponification numbers. The acid and saponification numbers were said to give an insight as to the relative proportions of acids, esters, and resenes present in rosin being on the whole approximately 85 per cent acids, 5 of esters and 10 of resenes.

The literature, stated Mr. Georgi, names some forty odd crystalline rosin acids, not to mention references to noncrystalline acids. Abietic acid was said to be the only known rosin acid at present which forms a double salt that can be isolated and crystallized. The importance of this salt in the chemistry of rosin size was emphasized.

Oxidation was the last point considered. It was pointed out that oxidization is particularly annoying since the decomposition of the oxidized molecule and the subsequent development of color begins to take place in the neighborhood of 125 deg. C. and hence the trouble may not be detected until the rosin reaches a point in the process where this temperature is attained. The suggestion was also made that some discoloration may be noticed in powdered rosin held at room temperature, but that those color changes are probably brought on by photochemical decomposition.

Size Making

Mr. Krimmel in his paper on Losses in Size Making and Observations in the Cooking of Rosin presented layout details of the equipment utilized in his study and gave figures of the calculated losses resulting from the operation.

Knowledge of Sizing and Capillary Flow

Miss Cobb in her paper, What I Do Not Know About Sizing and Capillary Flow, written from the viewpoint that what is not known should be known, discussed contact angles and the laws governing penetration and swelling by fluids; the physical state and position of sizing materials in the fiber; the reason for existence and the effect of internal and surface sizing; and the basis of water, grease, moisture, and ink resistance as well as suggested or reviewed some test methods.

Theory of Olation

Certain peculiarities in the properties and complicated nature of basic aluminum salt solutions were explained by a theory of polymerization known as *olation* in the paper by Mr. Thomas on Solutions of Basic Salts of Aluminum. Mr. Thomas stated that this theory of olation had been originated by Werner and Pfeiffer; and that it, when supplemented by the phenomenon of *oxolation*, provided an explanation for the properties of basic metallic salt solutions including the colloidal state thereof.

The Bennett Process

The Bennett size-making process, in Mr. Neitzke's paper entitled, Principles of Bennett Size Making Process, was stated to be adaptable for the preparation of sizes from a wide variety of thermoplastic materials such as rosins, paraffin waxes, amorphous waxes, montan wax, carnauba wax, stearic or oleic acids, asphalts, synthetic waxes, and, in some instances, oils. Characteristics of some of these raw materials with the usual procedure for utilizing them in this process were described as was the process itself. The process, in brief, was stated to be carried out by subjecting such materials as have been mentioned (containing at least one saponifiable ingredient) and an alkaline solution to the action of a specially designed dispersion machine. In this machine, the saponification reaction was said to take place practically instantly and this was followed by the dispersion and stabilization of the unsaponifiable portion of the thermoplastic material. The dispersion machine, as described, consists of a cylindrical steel shell containing a centrally aligned impellor with four helicoidal bars shaped somewhat in the manner of lawn mower blades. The material in process in the machine is spread out around the shell in a relatively thin layer, ¼ to ½ inch thick, and is subjected to the violent shearing and impacting action of the blades which rotate at a speed of 1000 to 1500 r. p. m. The total time of passage through the machine was given as from six to nine seconds.

Special Rosin Sizes

Among the sizes mentioned by J. A. DeCew in his paper, Special Types of Rosin Size and Their Physical Properties, were a cold process caustic soda size, size made by replacing the usual alkali with either silicate of soda or aluminate of soda, size made with ammonia, and dry size.

The purpose of using caustic soda for making rosin size, stated Mr. DeCew, is either to accelerate the reaction or to be able to make a size at a lower temperature or to obtain a more stable compound—a cold and very dilute solution of caustic soda dissolving and producing a dilute size solution in which the rosin is almost completely saponified. Another process, not yet introduced to the trade, was mentioned. It consists in making a high free rosin size with caustic soda without boiling, and is based upon the discovery that at temperatures just below the point at which rosin becomes sticky and at concentrations of approximately 10 per cent of soap, this size will dissolve free rosin in large quantities.

Size made with silicate of soda or sodium aluminate must be much more strongly alkaline than any other type, stated Mr. DeCew. He also pointed out that such a size might be useful where a very stable size is required.

When commenting upon the rapid decomposition of ammonia size, Mr. DeCew related that a recent discovery, involving the use of an ammonia soap in such a manner that it will actually size a paper that contains alkaline fillers, prompted the development of a new and simple method for making an ammonia size which had never before been suggested in any publication; and that this method of sizing paper may have a far reaching effect upon the properties of those types of papers which are more useful when they have no total acidity whatever.

Mr. DeCew also commented upon the skill required in the making of commercially prepared size; discussed briefly the subject of dry size; explained the process of emulsification; and classified sizing compositions in the order of their stability.

Report on Testing Non-Fibrous Raw Materials

The last paper scheduled on the program of the sizing meeting constituted a report of the Non-Fibrous Raw Materials Committee of T.A.P.P.I. It was entitled, Testing of Non-Fibrous Raw Materials, and was the subject of C. E. Peterson. In this paper, resulting from the study of a questionnaire submitted to the industry, was tabulated information covering the testing habits of various mills in regard to non-fibrous raw materials. One table concerning the various materials shows the number of reporting mills, the number that neither test nor buy on specification, the number that use specifications but do not test receipts, the number that test receipts but do not have standard specifications and the number that both test receipts and have standard specifications. Another table shows a grouping of materials according to the prevalence of testing; while a third table shows the variety of tests that are considered important by different laboratories. It was further reported that the questionnaire has shown the need of establishing standard methods for evaluating the properties of dyes, sodium silicate, sizing glues, rosin size, starches and waxes.

Paper Manufacture Meeting

The papers scheduled for presentation before the Paper Manufacture Meeting included *The Use of Adhesives for Laminating Operations*, by Russell Morehouse, The Philadelphia Quartz Co., Philadelphia, Pa.; *Paper Machine Water*, by L. M. Booth, Booth Chemical Co., Elizabeth, N. J.; *The Influence of the Head Box and Slice on Sheet Formation*, by G. D. Bearce, Consulting Engineer, New York City; *Admission of Stock to the Fourdrinier Wire*, by A. B. Green, Management Engineer, Needham, Mass.; and *Electric Drive for Cylinder Machine Wet End*, by G. A. Peterson, Rice, Barton & Fales, Worcester, Mass.

Laminating with Adhesives

Mr. Morehouse in his paper on The Use of Adhesives for Laminating Operations dealt with some of the factors governing the use of adhesives for laminating board together with the results obtained under various manufacturing conditions. Among the fabricating materials which were mentioned were jute liner stock, chip and groundwork papers, straw paper, solid kraft liners, filled krafts, and corrugating papers made of kraft, pine and chestnut wood pulps, and other materials. A dry finished sheet was stated to exhibit less resistance to adhesive penetration than a sheet having a water finish. Moisture content of the paper, likewise, was said to have an important bearing upon adhesive penetration—absorption of adhesive being excessive when the paper is dry and retarded when the paper contains an abnormal percentage of moisture.

Silicate of soda and starch adhesives characteristics were then touched upon, it being emphasized that rapid contact of the various plies was important when the adhesive is silicate of soda but that immediate contact does not seem so important when a starch adhesive is used.

It was also explained that the adhesives under discussion set and form their bond by the loss of water which is absorbed into the various paper plies and ultimately some of which evaporates into the atmosphere; that the use of an adhesive at a higher concentration than normally had proven effective when two adjacent plies were widely dissimilar with regard to density or surface texture; that storage of roll stock in a heated atmosphere prior to use is recommended, although ample pre-heating on the laminating machine is often a satisfactory substitution; that the spraying of wet steam upon paper stock with too low moisture content prior to application of adhesive has at times proved

effective against the too rapid absorption of adhesive; that stock containing excessive moisture can usually be laminated but at reduced machine speeds; that starch adhesives usually must be used hot; and that adhesive silicates of soda are generally used at factory room temperatures with 100 deg. Fahr. probably being considered as the maximum advisable degree of elevation.

Quality of Water

A plea was made by Mr. Booth in his paper on Paper Machine Water to study water quality with particular reference to its influence in forming a sheet of paper. Similarity between the quality of the fresh water supply and that with which the sheet is formed was shown to be lacking. This was said to be due to the presence of soluble residue of size, starch, alum, etc. furnished to the beaters.

Mr. Booth cited the alum used to set rosin size as an example of low efficiency. He said that although there may be used a size which with respect to alum has an alkaline equivalent of one part of size to one one-third part of alum, experience proves the desirability of using a much higher ratio of alum. He continued, "For instance with the frequently used 1:1 ratio it appears that after the size has been set, two-thirds of the alum used in the furnish serves no useful purpose. In specific terms this means that with a furnish of 2 per cent of size and 2 per cent of alum there remains in solution 26.7 pounds of alum per ton of furnish. This customary waste of alum need no longer be deplored since the alum can be later utilized to good advantage."

It is logical, when making a sized paper, the stock suspension arriving at the wire containing alum in solution, in the opinion of Mr. Booth, to utilize this excess alum in producing a coagulating precipitate—the cheapest and most effective reagent in this instance to produce the desired aluminum hydroxide from the alum being hydrated lime. This material was stated to be most effectively applied as a less than saturated solution.

It was also pointed out that it is readily possible by using water treatment methods to make the water drain more slowly or to drain more freely in accordance with the requirements—for instance, when making a multi-ply board, the rate of drainage from the center is slowed up and the water from the outer plies is made to drain more freely. Mr. Booth also stressed the point that the usual dilution of the stock as it arrives at the machine does not comprise adequate preparation for sheet formation.

Among the advantages claimed for controlling the water close to the wire are: better formation, smoother surface, foam reduction, increased bursting strength, and white water more suitable for reuse.

Principles of Sheet Formation

The paper by G. D. Bearce on The Influence of the Head Box and Slice on Sheet Formation reviewed the principles and patents relating to the control of paper sheet formation and discussed three basic principles of sheet formation, namely: the maintenance of a homogeneous and uniform distribution and dispersion of fibers in the head box, the uniform delivery of the fiber suspension onto the wire, and the contact of the fiber suspension with the wire.

In reviewing the principles and patents relating to the control of paper sheet formation, Mr. Bearce mentioned and explained the principles involved in the design of several slices, among which were the Voith, Van de Carr, Bell-Irving, Valentine, Teale, and Cape. He also mentioned the flexible top apron (Bagley), the stock mixer roll in the head box (Aldrich), the adjustable hump in the apron (Hyde), the introduction of an electrical charge to prevent flocculation (Hazmburg), and adjustable slice bars (Cape).

In discussing the suspension and movement of fibers in a head box it was stated that it is generally agreed that the number of passes in a head box should be held to a minimum in order to shorten the distance in which the stock mixture is being accelerated, consistent with the steady flow of the mixture. Mr. Bearce also said that the consistencies of stock in the head box range from about 0.1 per cent for light weight tissue to 0.8 or 0.9 per cent for some book papers; that news on high speed machines is about 0.65 per cent, and groundwood sheets between 0.3 per cent and 0.4 per cent; that some medium weight sulphite bonds are approximately 0.50 per cent, and sulphite waxings 0.3 to 0.4 per cent; and that high grade writings are about 0.75 per cent.

The effect of stock velocity upon formation was also touched upon and it was emphasized that the controlling factor of sheet formation is the "initial coating" of the stock on the wire or the theoretical fiber layer next to the wire. Other wet end factors that received consideration by Mr. Bearce were breast roll, pitch of wire, forming boards, table rolls, baffles, shake, dandy, and suction boxes.

Stock Admission to Wire

A. B. Green in his paper, Admission of Stock to the Fourdrinier Wire, reviewed the origin and purpose of slices in the evolution of the fourdrinier machine, suggesting that they were necessary from almost the beginning. Relative speed of the flat stream leaving the last slice and the wire, said Mr. Green, is a matter of conjecture rather than agreement. He mentioned that a slice pond ten inches deep allows for a running speed of about 438 feet per minute; whereas the slice pond must be about four feet five inches deep to obtain 1,000 feet per minute.

Machine speeds, reported Mr. Green, began to exceed the capacity of low-head slices about 1900. He said that the first attempt to modify practice for speed was to slant wire downward from slice to couch and that this was followed by the high pressure inlet. Advantages of high pressure inlets were then given. They included better spread and formation, increased speed where drying capacity allows, improved paper texture, reduced cost for drying, more uniform caliper across the web, reduced wear on wires, higher retention of minerals, and better uniformity as between the two sides of the sheet.

Mr. Green commented upon the need for information which would support good engineering and inlet practice and suggested a log of operation that might be utilized in such a study—the data being obtained from a number of consenting mills and then compiled by a competent T.A.P.P.I. committee into tables for reference by paper makers and engineers.

Electric Drive for Cylinder Machine Wet End

The last paper scheduled on the program of the Paper Manufacture Meeting was that of G. A. Peterson and was entitled, Electric Drive for Cylinder Machine Wet End. In this paper Mr. Peterson briefly outlined the difficulties involved in developing a wet end mechanical drive for a cylinder machine and then proceeded to explain the application of an electric drive for the same purpose. It was stated that when completely equipping a machine with auxiliary drives, motors are employed to drive the cylinder molds or cylinder couch rolls, the lower rolls of the primary presses, the top and bottom roll of the suction primary if there is one on the machine, the strain roll, the suction drum roll, either the top or bottom extractor rolls, and the top press roll—the current for driving these motors being supplied from a generator which, in turn, is driven from a bevel gear unit driving the first press. It was also explained that in plants where no direct current is available, a small a-c., d-c. exciter set is furnished for supplying direct current excitation for generator and motor shunt fields.

Felt savings doubtless amounting to as much if not more than the original cost of the equipment and savings in steam for drying were given as the outstanding economies resulting from the operation of this type of electrical drive.

In addition it was suggested that the principle used in driving the units of the wet end of a cylinder machine might also be applied the top press roll on the other presses; and that patents have been applied for fully covering the top press roll drive, the rights of which have been assigned to the Reliance Electric & Engineering Company and Rice, Barton and Fales, Inc.

Sessions of the Third Day

The program of the third day of the convention included five different meetings, two in the morning and three in the afternoon, and the presentation of twenty-six different papers. Of these twenty-six different papers, four were scheduled before the Color and Graphic Arts Meeting and six before the Heat and Power Meeting, the two meetings of the morning session.

Color and Graphic Arts Meeting

The first three papers on the program of the Color and Graphic Arts Meeting, over which A. W. Nickerson, C. F. Clarkson and J. L. Parsons presided as chairmen, presented a complete panorama of the fundamentals of color from different perspectives. A. E. Gessler presented the first of these three papers. The subject of his paper was *Chemistry of Color*. Color as Light, the subject of the second paper, was presented by A. C. Hardy; while the third paper, a presentation by George Welp, was entitled, Color in Use.

The Optical Characteristics of Paper, the fourth paper on the program of this Color and Graphic Arts Meeting, was the subject of F. A. Steele, Chief of Paper Section, The New Jersey Zinc Co., Palmerton, Pa. In this paper Mr. Steele presented a formal mathematical treatment of relationships between basis weight, reflectance, contrast ratio, and other optical properties. Derivations of the original equations of Kubelka and Munk, which show the relationships between reflectivity, reflectance over a background of known reflectance, and the thickness of thin layers of a diffusing substance, were given. Since these equations are too cumbersome for routine application, charts were given whereby the calculations are simplified. The use of the charts in making calculations was explained and it was suggested that the various calculated values agree, in general, with observed values very nearly within the error of observation.

Heat and Power Meeting

Operating Practice in Switching and Power Distribution in Paper Mills, by A. C. Bird, Electrical Engineer, Hardy S. Ferguson & Co., New York City, was the first formal paper scheduled before the Heat and Power Meeting with M. H. Teaze, A. G. Darling, and R. R. Baker as Chairmen. In this paper, Mr. Bird indicated operating practice and power distribution schemes prevailing in pulp and paper mills erected within the last few years in the United States and Canada. He stated that the usual voltages for motor distribution in this country are 440, 550, and 2200, three phase, a.c., while in Canada the predominant voltages appear to be 550 and 2200; and that for lighting purposes, 115 volts is generally accepted, using the standard 230/115 volt three wire system of distribution, obtained from stepdown transformer whose primary operates at the motor voltage. He recommended the location of substation as close to large load centers as practicable in order to maintain short and economical feeder runs; suggested that the layout of switching equipment in a substation depends entirely upon local conditions and to what extent the mill owner feels justified in spending money for refinement in operation and safety; and stated that manually operated 440, 550, or 2200 volt switching equipment, preferably of the cubicle type, can be economically used if the layout permits, but that the ideal arrangement calls for electrically operated remote controlled equipment segregated from the control room.

It was further stated that open wiring in pulp and paper mills is being gradually displaced by conduit wiring; that care should be taken in the choice of electrical equipment to select proper materials to withstand atmospheric conditions encountered; that motors should be selected with insulation to withstand moisture and acid vapors and careful consideration given to type of frame to suit local conditions; that synchronous motors used on equipment vital to continuous process work should be equipped with field removal relay to permit motor to automatically resynchronize if it falls out of step due to voltage dips or line surges; and that wherever possible two distinct sources of power supply should be available for fire pump motors.

Steam Accumulators

The second paper, entitled, *Steam Accumulators in Paper Mills*, a joint contribution of D. K. Dean and G. M. Cameron, both of Foster-Wheeler Corporation, New York City, was presented by Mr. Dean. It was brought out in this paper that heat storage in many plants is as necessary as is the storage of raw or partly finished material to prevent interruption in production; and that the steam storage system devised by Johannes Ruth of Stockholm is developed upon the principle of storing in a large quantity of water, under pressure and at saturation temperature, the heat energy of steam and of releasing this energy in the form of steam by decreasing the pressure. Steam storage in a paper mill was stated to offer a distinct advantage to boiler operation, to operation of paper machines, and to digester operation through balancing the production and consumption of steam. The stabilization of unbalanced load conditions with a hot water accumulator was explained, the possible adaptation of the heat or steam storage function of an accumulator to heat recovery from digester blow-down cited, and possible methods of heat recovery in de-inking and acid plant operations as well as in the operation of internal combustion engines described.

Steam Pressure and Temperature Limits

Kerr Atkinson, Engineer, Jackson & Moreland, Boston, Mass., another contributor to this program, stated in his paper entitled, *Practical Limits for Steam Pressure and Temperature in Paper Mill Power Plant Service*, that there are, speaking broadly, only two practical limits to the pressure and temperature a mill may employ for power production, namely: the development of the art and the value of returns on investment. Attention was called to the fact that quantities of steam for process and power requirements vary from mill to mill and from time to time; and that they vary with type of product, nature of the process, theories of the operator and discipline of organization. Improved thermal efficiency in power generation was said to be the only benefit derived from raising pressure and temperature, and that, as a practical fact, it seldom happens that anything approaching an ideal steam and power supply can be adopted. The steps to be taken in determining the limits of design and capacity for plant increment involved discussion on a number of points, among which were determination of status of existing steam and power balance, fixing limits to scope of project, determination of specific design, provision for future development, and considerations of initial cost. It was, likewise, brought out that operating expense is only slightly increased by high pressure and temperature if the design is not too close to the frontiers of experiment; that personal factors also influence development; and that full co-operation between management, operators, manufacturers and consultants is important to the success of a new venture.

Turbine Pressure and Temperature Limits

Practical Limits in the Use of High Pressure and Temperature in Turbines 1,000 Kw. to 10,000 Kw. Rating was the title of another paper scheduled for presentation before this meeting. It was the subject of W. T. Manning, Design Engineer, Westinghouse Electric & Manufacturing Co., Philadelphia, Pa., who stated that a very general answer to the question of pressure and temperature limits of steam turbines having ratings of 1,000 to 10,000 kw. is that these limits, as far as mechanical construction is concerned at the present, are about 1,400 pounds per square inch gauge and 850 deg. Fahr. TT. with 1,000 deg. Fahr. TT. being regarded as the ultimate limit to be obtained in the future. High temperature was said to result in more difficult problems than the high pressure.

Mr. Manning pointed out that as far as design is concerned, the maximum pressure and temperature limits of turbines and turbines details within the ratings considered in his paper, would appear to be beyond those that can be utilized to economical advantage in the paper industry at the present time. He then discussed in some detail modifications of turbine design to meet the increased pressures and temperatures. Such details as blading, nozzles, valves, and lubricating and governing systems were covered in this treatment.

High Pressure Boilers

F. H. Rosecrantz of Combustion Engineering Co., New York City, in his paper, *Construction Problems Associated with High Pressure Boilers for the Pulp and Paper Industry*, suggested that there is no technical reason why boilers from the smallest to the largest size required in the pulp and paper industry cannot be built for high pressure and high temperature operation. The ideal pressure in any instance, he said, is that pressure in combination with the steam required for process which will produce, when expanded through a high pressure turbine down to process pressure, the amount of power required to operate the plant.

Mr. Manning also threw the spotlight on drum construction for high pressure boilers as well as accessories, and cautioned that water conditions which have been found entirely satisfactory for 150 to 300 pounds pressure may be found to be very troublesome with operating pressures of 600 to 800 pounds gauge, although there are few situations which by suitable treatment cannot be handled in a satisfactory manner.

Subcommittee Progress Report

The last paper scheduled on the program of this Heat and Power Meeting constituted the annual progress report of the Production and Transmission of Heat and Power Subcommittee of the Engineering Division of T.A.P.P.I. In this report entitled, *Heat and Power Production and Transmission*, F. P. Wilmer, Engineer, The Albemarle Paper Manufacturing Co., Richmond, Va., the contributor, stated that it was the third annual progress report and that it had been compiled from reports submitted by representative manufacturers of equipment for the production and transmission of heat and power, the manufacturers' reports being quoted verbatim insofar as possible. Among the major classification headings included by the report were steam generation, steam distribution, steam power, hydraulic power, oil engines, generation of electricity, distribution of electricity, and plan and design of power plant and distribution systems; while among the equipment manufacturers covered by the report were The C. O. Bartlett & Snow Company, The Fairfield Engineering Company, Sauerman Brothers, Inc., The Babcock & Wilcox Company, Foster Wheeler Corporation, B. F. Sturtevant Company, Ferguson Engineers, Coen Company, The M. A. Hofft Company, Bailey Meter Company, Leeds & Northrup Company, Republic Flow Meters Company, Combustion Engineering Company, Inc., Riley Stoker Corporation, Henry Vogt Machine Company, Yarnall-Waring Company, The Permutit Company, Elgin Softener Corporation, Worthington Pump and Machinery Corporation, The Foxboro Company, C. J. Tagliabue Manufacturing Company, Hagan Corporation, The Swartwout Company, Crane Company, Homestead Valve Manufacturing Company, The E. F. Keating Pipe Bending Company, The M. W. Kellogg Company, The William Powell Company, General Electric Company, Newport News Shipbuilding and Dry Dock Company, Baldwin-Southwark Corporation—I. P. Morris Division, S. Morgan Smith Company, Busch-Sulzer Bros., McIntosh & Seymour Corporation, Westinghouse Electric and Manufacturing Company.

Three Afternoon Meetings

The afternoon program of the third day of the convention included a Color Meeting with John L. Parsons as Chairman; a Mechanical Pulping Meeting with M. P. Chaplin as Chairman; and an Alkaline Pulping Meeting with H. R. Murdock and W. T. Webster as Chairmen.

Papers on Coloring

The papers scheduled for presentation before the Color Meeting included *The Coloring of Cellulose Fibers*, by R. E. Rose and J. Carl Schmidt; *Definition and Instrumentation Regarding Brightness*, by M. N. Davis and L. J. Lewis; *Method for Determining the Whiteness of Paper*, and *Dependence of Reflectance and Opacity on Thickness; Relation Between Contrast Ratio and Printing Opacity*, by D. B. Judd; *Reflection Measurements on Pulp and Paper*, by R. S. Hunter, and *A Study of the Factors Influencing the Brightness of Paper as Recorded by the General Electric Reflection Meter*, by Edwin R. Laughin and Otto Kress.

In this last paper, Mr. Laughin, Color Technician, E. I. du Pont de Nemours & Co., Inc., and Dr. Kress, Institute of Paper Chemistry, presented the results of a study made in an effort to determine which of the variable encountered in the manufacture of paper exercise the greatest influence in the control of brightness. The results of the study indicated that the matter of control of brightness is dependent upon the uniformity or the raw materials and upon the constancy with which the filler content (if any is used) is maintained; and that it is entirely possible for mills to aid brightness maintenance within the desired grading limits by the proper applications of dyestuffs, provided that the other paper making variables are controlled with reasonable uniformity.

Mechanical Pulping Meeting

American Groundwood Developments was one of four papers presented before the Mechanical Pulping Meeting. In this paper, W. E. Brawn of Brunswick, Me., the contributor, presented a general review of groundwood practice in America; and pointed out the tremendous expansion of the industry; called attention to some of the effects brought about by new and improved equipment; and made a comparison between the mill survey data published by the Ground Wood Committee of 1925 with the data secured in a very recent survey. A comparison of the two surveys revealed many changes since the publication of the first one—the two principal ones being the use of much larger types of production units and the use of artificial pulp stones. It was pointed out that individual unit production has been increased approximately five times over the production common only a few years ago.

A recent survey made of groundwood mills of Europe was the subject of a paper entitled, *European Groundwood Mill Practice*, by Bernard Bornstein, Technical Adviser, The Norton Company, and a member of the Mechanical Pulping Committee. This paper, presented and discussed by D. M. Chisholm of Hamilton, Ontario, pointed out that artificial pulp stones have been in successful use in European mills for a good many years; that the European artificial stones are solid being composed of either sand, ground lava or emery as the abrasive and usually employ cement as the binding material; and that these stones are quite soft and have a life comparable to natural stones.

It was also pointed out that the general practice in most European mills is the use of the so-called "thin-grinding" method where the consistency of the pit stock is kept somewhat less than 2 per cent and frequently as low as 1 per cent with a temperature about 140 deg. Fahr. In such an operation the stone is immersed in about only an inch of pulp and high pressure showers are applied directly to the stone in both front and rear. Practically all users of this method claim 10-15 per cent increase in production over the hot grinding system and give as the reason for it that the stones can be kept very sharp without making the customary amount of slivers.

The wood used by most European mills was stated to be 100 per cent clean, sound spruce. This wood is very dense and samples which were grown in Sweden had annular rings so close together that they could not be counted without a hand lens.

It was also brought out that wood inventories at the mills are seldom large; that the wood is never allowed to age; that if this wood is dried out completely, it would probably be too hard to grind satisfactorily; and that some pulp makers state that this spruce is not the same species as that grown in America, that the fibers are short, and that paper made from this pulp has characteristics peculiar to this type of wood.

In addition, it was stated that foreign mills are striving to take the human element out of pulp grinding; that there is very little blue glass examination of pulp from each stone; that much pulp is produced for export and is sold according to standard freeness and strength tests; and that testing laboratories are complete in every detail and are supervised by men who are good engineers and keen observers.

After presenting the picture of both American and foreign mill practice the meeting was devoted to a discussion of laboratory and experimental methods in pulp production.

Laboratory Methods in Mechanical Pulp Production

Dr. H. Wyatt Johnston of the Canadian Forest Products Laboratory presented a talk on the work which has been done at McGill Institute of which the following is a brief resumé:

Recent work on mechanical pulping at the Institute has been devoted to a study of high speed grinding and its effect both on the cost and quality of pulp. The results so far indicate that a good quality of ground wood could be produced at stone surface speeds far in excess of that at present used and that power requirements for such high speed production would not be increased and might even be slightly reduced.

The grinder used at the Institute for this experimental work employs a stone considerably smaller in diameter than the ordinary pulp stones used in commercial mills. It is arranged with a

variable speed drive and variable speed motor so that the surface speed of the stone can be set at any desired value.

After the pulp is produced it is subjected to the usual pulp test including classification and then is made into test sheets which are tested for paper quality. The data submitted by Dr. Johnston indicated that the Institute is going into this work very thoroughly and the information developed is of great interest and value to the industry.

One of the large Canadian mills has increased grinder speeds in commercial production and the data secured from such operation compared very favorably with that of the Forest Products Laboratory. The work so far indicates that an increase in grinder unit production of 50% can be expected, thus reducing floor space and capital expenditure. This work is being continued and future developments will undoubtedly be of value.

An interesting development of the Canadian Institute is the building of what is perhaps the smallest pulp grinder in the world. It has a pocket area of approximately 2 sq. in. and is designed to afford facilities for making a special study of the action of the stone on the wood with a view to increasing the efficiency of operation. It is anticipated that this machine will enable the development of considerable fundamental data along lines of which we are at present entirely ignorant.

Dr C. E. Curran, in charge of the Paper Section of the Forest Products Laboratory, when speaking upon Forest Products Laboratory Mechanical Pulping Plans stated that an experimental pulp grinder is now being installed at the laboratory; that this grinder will have a stone of approximately the same diameter as that commonly used in commercial grinders and pockets of approximately the same width as used in commercial production; but that the width of the stone face will be comparatively narrow allowing for the grinding of wood six inches in length. It is anticipated that much interesting and valuable data will be secured in the experimental operation of this piece of equipment.

In connection with a chart shown on pulp classification to determine fiber length, it was pointed out that while there is a very definite trend in the percentage of pulp included in various classes it does not follow that two pulps which classify very nearly the same will produce the same quality of paper or operate in the same manner on the paper machine.

Alkaline Pulping Meeting

Six papers were on the program of the Alkaline Pulping Meeting. They included papers entitled *Possibilities of Improving Pulping Characteristics of Pulpwoods by Controlled Hybridization of Forest Trees*, by Ernst J. Schreiner, Research Forester, Oxford Paper Co., Rumford, Me.; *The Cooking of Kraft Pulp with Improperly Settled White Liquor*, by Otto Kress and Ward D. Harrison both of the Institute of Paper Chemistry, Appleton, Wis.; *The Distribution of Sulphur in the Kraft Cooking Operations*, by Otto Kress and J. W. McIntyre both of the Institute of Paper Chemistry as in previous case; *Heat Requirements of the Sulphate Process*, by W. T. Webster; *Evaluation of the Heat Input into Alkaline Pulping Digesters*, by Harold R. Murdock, Director of Research Department, Champion Fibre Company, Canton, N. C.; and *Recent Trends in Black Liquor Evaporator Designs and Their Use in Multiple Effect Combinations*, by W. T. Hinckley, Chemical Engineer, Swenson Evaporator Company, Harvey, Ill.

Hybridization of Pulpwood Trees

Mr. Schreiner in his paper on Possibilities of Improving Pulping Characteristics of Pulpwoods by Controlled Hybridization of Forest Trees stated that the improvement of forest trees by breeding or by pure line or mass selection can be expected to prove profitable not only to the wood producer but also to the industry which utilizes the wood; and that breeding and selection, directed toward the best correlation of what may be termed "forest requirements" of the producer and use requirements of the industry, is practically an unexplored field.

He also suggested that the new hybrid poplars which have been produced by the breeding project of the Oxford Paper Company are decidedly more valuable than native poplars; that they grow more rapidly, are more easily propagated and in numerous cases are more resistant to diseases; and that on the basis of investigations on young tree, many of the hybrids can be expected to produce wood with a longer average fiber length and somewhat higher density than the wood of the native poplar (aspen) commonly used in Maine for soda pulp.

Kraft Cooking Studies

In the joint paper by Dr. Kress and Mr. Harrison on The Cooking of Kraft Pulp with Improperly Settled White Liquor, it was stated that kraft cooks were made with liquors to which calcium carbonate sludges and clay had been added respectively, in order to stimulate cooks made in the mill with improperly settled white liquor; that the pulps from such cooks showed a loss in strength, had an undesirable gray color, and resembled commercial pulps made with improperly settled liquor; and that the undesirable characteristics of such pulps were due to the presence of mechanically entrained calcium carbonate which may be removed from the pulp by improved washing conditions.

Two investigations were carried out in the study of the chemical conditions and distribution of sulphur during the kraft cook as reported in the joint paper The Distribution of Sulphur During the Kraft Pulping Operation by Dr. Kress and Mr. McIntyre. The first of the two investigations took up the distribution of sulphur regardless of conditions at the end of the cook; while the second dealt with a study of the methods used for the determination of sulphide in black liquor, and the variation of the sulphide in the liquor during the cook. The results of this investigation revealed that a sulphur balance on the cooking operation shows that a very small percentage, usually below 0.05 per cent of the total sulphur present, is liberated from the charge in gases noncondensable in a water-jacketed condenser; that when black liquor is drained from the cooked chips and analyzed for chemical content, the results are low, due to a retention of chemical by the chips; that the chemical so absorbed is readily removed by washing; that the most accurate of the methods studied for the determination of the apparent sulphide content of kraft black liquors is the evolution of the sulphide from an untreated sample of the liquor by ammonium chloride using neutral cadmium sulphate to absorb the liberated sulphide; that the titration of black liquor, which has been treated with barium chloride, with ammoniacal zinc nitrate solution using ammoniacal nickel nitrate as indicator, is simple and accurate when the liquor sample is fresh; that the sulphide content of kraft black liquor as determined by usual methods undergoes little change after the first hour of the cooking cycle; and that about 50 per cent of the sulphide present in the white liquor appears as sulphide upon analysis of the black liquor at the completion of the cook, by the zinc method or by the ammonium chloride evolution method.

Calculating Digester Heat Input

Mr. Murdock in his paper, Evaluation of Heat Input into Alkaline Pulping Digesters, suggested that it is common, in mills producing wood pulps, to use steam flow meters to measure the use of steam and questioned whether such steam usage as indicated by the meters compared favorably with the theoretical requirements which may be calculated from available data. Then it was pointed out that the heat needed to raise a digester to temperature may be divided into heat needed to bring digester shell to temperature, heat needed to bring contents of digester to temperature, and radiation losses which consume steam before actual blowing of digester. A method of procedure was then presented by Mr. Murdock for calculating the heat needed for the digester shell and to raise the digester contents to temperature as well as to calculate heat lost by radiation during the cook.

Evaporator Design Trends

Mr. Hinckley's paper, Recent Trends in Black Liquor Evaporator Design, reviewed evaporation practice in alkaline pulping mills, commented upon various types of evaporators, and called attention to the need for low cost corrosion resistant materials of construction for evaporators. The horizontal tube, the submerged-tube vertical, the forced-circulation and the long-tube film types of evaporators were the types of evaporators considered by Mr. Hinckley. In his consideration of evaporator types he

mentioned both the merits and shortcomings of each. He also discussed in some detail various multiple effect combinations and touched upon high density operation of evaporator arrangements.

Sessions of the Fourth Day

The morning of the last day of the convention, February 21, was given over entirely to a Stuff Preparation Meeting with C. E. Curran, F. C. Clark, and D. Manson Sutherland presiding as chairmen.

Stuff Preparation Meeting

At this meeting, F. A. Simmonds of the Forest Products Laboratory staff presented a brief summary of the recent literature on hydration and followed these comments with comments upon a joint paper by P. K. Baird, also of the Laboratory staff, and himself on Procedure for Investigating the Relation of Freeness and Fiber Size to the Hydration of Stuffs. In these comments he suggested that a procedure had been devised for removing water from the fibers without changing the fiber lengths and that freeness of fibers after dehydration was found to be higher.

Influences of Temperature on Beating

Dr. H. F. Lewis of the Institute of Paper Chemistry then reported briefly on the joint paper by La Vern A. Gilbertson, also of the Institute, and himself on *Effect of Temperature on the Beating of Rag Stock*. In this paper, it was brought out that a temperature-controlled Noble and Wood twenty gallon beater had been used in a study of the changes taking place in the beating characteristics of rag stock with variations in temperature between 6 and 85 deg. C.; that the results indicated that the rate of beating is somewhat faster at 25 deg. than at either 6 or 45 deg.; that the slowest beating took place at 85 deg.; that hand sheets made from stock beaten at 6 deg. C. had folds of 6125, tear (16 sheets) of 182, Mullen of 49, and tensile of 12.42 pounds as contrasted with folds of 240, tear (16 sheets) of 125, Mullen of 28 and tensile of 9.33 pounds for hand sheets made from stock beaten at 85 deg.; that chemical constants, such as *a*-cellulose, copper number, and viscosity, are unaltered either by the time or temperature of beating; and that photomicrographs at the point of Mullen rupture show that such a rupture occurs in the cold beaten stock by the fibers pulling out, while the break results from the fracture of the fibers as well as fracture of the cementing material in the hot beaten stock.

Beater Control Methods

Arthur B. Green, Management Engineer, Needham, Mass., following the remarks of Dr. Lewis, presented a brief resumé of his paper on *Beating from Standpoints of Control and Design*. In this paper, Mr. Green portrays the efforts that have been made to supplant the Hollander, discusses the widening field for beating, tells of the attempts made to control the beating operation, and treats extensively the subject of measurements of beating. The first problem of the mill insofar as beating is concerned, in the opinion of Mr. Green, is to control or definitely manage the process as it exists in order to get uniform paper making characteristics in the stock up to the paper machine. It is also his opinion that measurement of the stock for paper making qualities and not measurement of the beater or refiner or the adjustment of either is the key to that control. The second problem, suggested Mr. Green, is the problem of design—the development of better equipment through an engineering method which would, according to his concept, eliminate useless effect elements, determine the right proportioning of the elements that remain and arrive at final design with least cost for purchase and operation.

The next paper, scheduled before the Stuff Preparation Meeting, was entitled *Beater Control* and was the subject of G. D. J. Ormsbee of the Toledo Scale Company. Mr. Ormsbee in his remarks described in some detail the design principles involved in the construction of the system that is being manufactured by his company for control of beater roll pressure, and explained results obtained while in use.

Rod Mill Applications Discussed

Paper Stock Treatment, Mixing and Beating With Rods was the title of the next paper, only a resumé of which was presented by its contributor Sidney D. Wells, Technical Advisor, Combined Locks Paper Company, Appleton, Wis. This paper discussed to considerable length the application of the principle of beating with rods to the strawboard industry; to the de-inking of paper stock; to the preliminary treatment of pulps for bleaching; to the conversion of dry pulp sheets, paper broke, waste paper, etc. to slush pulp; and to the beating of kraft pulp. The application of the principle to the strawboard industry was said to result in marked savings in power together with greater yields through the use of less severely cooked stock and the reduction of knots to useful pulp; and that further application will make possible the combination of the function of cooking and beating. Its application to the de-inking of paper stock was said to make possible the retention of all of the benefits of the low density systems now in use with the additional advantage of steam requirements as low as in high density systems. It was also brought out that the preliminary treatment of pulps with rod action makes possible more uniform bleaching and that pulps cooked so as to preserve strength may be partially bleached in the rod mill with simultaneous development of strength and elimination of organic dirt and shives. Elimination of specks in old paper stock, it was also stated, can often be accomplished with one sixth the power taken by jordans or beaters to do the same work. In addition, it was suggested that the installation of the rod mill in closed circuit with screening systems makes possible the complete closing of the same with the complete conversion of the screenings to accepted stock.

Harry Williamson, Paper Making Consultant, following Mr. Wells' resumé of his paper, spoke for a few minutes with machine-gun like rapidity on the *Relationship of Stuff Preparation Theories to Practice*. His remarks for the most part reflected an operating man's point of view to thoughts expressed in several of the preceding papers of the session.

Other Stuff Preparation Papers

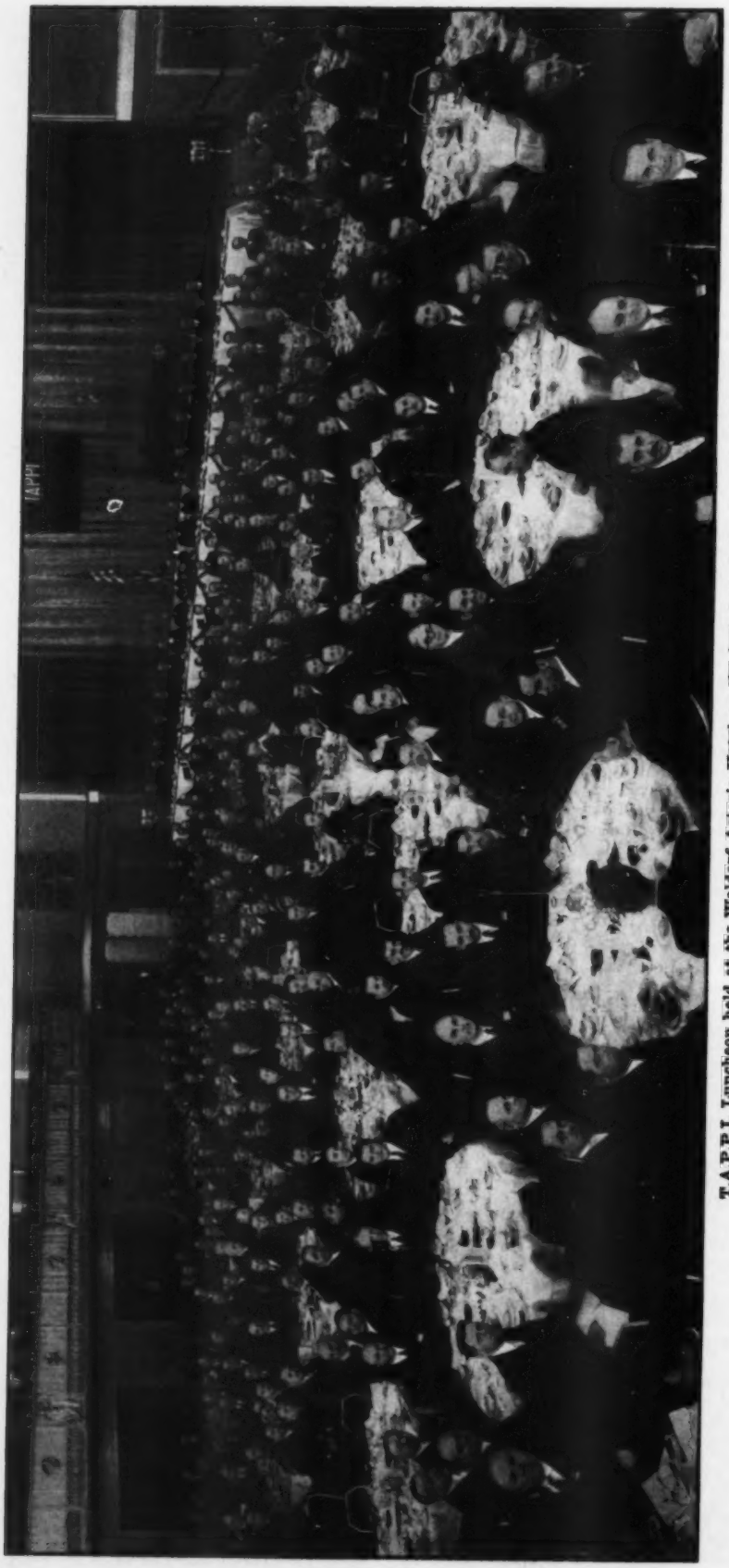
The remarks by Mr. Williamson completed the formal program of the morning although several other papers had been scheduled for presentation. Among these papers was a paper by J. A. De Cew entitled *Adverse Function of Gases in the Manufacture of Paper*, and a paper by D. Manson Sutherland on *Effects of Refining Action*. The formal paper by Mr. De Cew was limited to a discussion of the effects of oxygen, nitrogen, and carbon dioxide gases in the production of paper. Mr. De Cew stated that there are three forms in which these gases may be present in paper making, namely; on the fibers themselves, in the form of bubbles entrained in the aqueous mixture, and in solution in the water that carries the fibers through the various processes of manufacture. It is Mr. De Cew's contention that there will be far less difficulty in operation than there is today if the time ever comes when paper is made from liquids and solids only.

Mr. Sutherland in his formal paper on *The Effects of Refining Action* called attention to the need for simplification of terms used in stuff preparation and offered some suggestions in this connection. He also pointed out that refining action on pulps changes the fiber size, shape, and flexibility; that changes in fiber size, shape and flexibility can be determined by classification or screening tests; and that fiber size, shape and flexibility obtained by refining action are affected by the chemical and physical properties of the basic raw material or pulp.

Annual Luncheon Closes Convention

The annual luncheon and general meeting was left to the last of the program and what a fitting closing it made for a most successful four-day session—the twentieth annual convention of the association.

All members and guests of T.A.P.P.I. were welcomed to the luncheon by C. C. Heritage, president of T.A.P.P.I., who commented on the splendid attendance at the meetings and on the quality of work that the association was doing for both the membership and the industry. He extended full appreciation to each of the various chairmen of committees as well as to the various committee memberships and to all the speakers who had taken part in the meeting. He then mentioned the awarding of T.A.P.P.I. medals in the past to Messrs. Mason, Minton and Mahler and called upon F. C. Clark to present the 1935 T.A.P.P.I. medal, the fourth to be given in the his-



T.A.P.P.I. Luncheon held at the Waldorf Astoria Hotel on the last day of the Annual Meeting

tory of the association, to Edwin Sutermeister of the S. D. Warren Company of Cumberland Mills, Me.

Presentation of T.A.P.P.I. Medal

In making the presentation Mr. Clark stated that it had been his privilege to know Mr. Sutermeister personally for over twenty years. He told of some of the discussions that had resulted from conflicting opinions in some of their contacts. He mentioned that Mr. Sutermeister became interested in chemistry as a young man because of a book on the subject written by Dr. Ira Remsen and that this interest on his part led to an M. I. T. degree for him in 1899. He then told of Mr. Sutermeister's almost immediate association with the S. D. Warren organization, his association with the U. S. Forest Service from 1907 to 1911, and his return to the S. D. Warren organization in 1911 where he has remained ever since. Mr. Clark attributed Mr. Sutermeister's success in his chosen field of work to his deep seated determination to stick to each job until it was completed and to an unusual combination of analytical and synthetic mind.

Upon receiving the medal Mr. Sutermeister expressed his appreciation for it and reminisced a bit. He said that very few mills had chemists in 1899 and that in those days the work consisted mostly of analyzing caustic and bleach solutions. Then he told of a few years' experience when he was placed in charge of coloring the paper, and his return to the laboratory where he has since remained.

Mr. Sutermeister stated that much of his work during the years has been to improve and add to processes in use. He mentioned his work on the development of thin boiling starch for coating paper work, on the pebble mill test for fibers, on satin white, and casein. He told of his study of the soda process and of his literary efforts—mentioned that he had started to work on the material which has since been incorporated in his book Chemistry of Pulp and Paper Making for his own information and expressed his appreciation to S. D. Warren Company for permitting the publication of this book as well as his other material.

He expressed the thought that more and more technical men were going to be required in the future because of the growing complexity of operations and made some suggestions about research activities. It was his feeling that some of the former work should be gone over, in the light of new experience, and reorganized; that a basic study should be made on rosin sizing, in which each factor would be taken separately; that sulphite liquor wastes as well as soda and sulphate black liquors deserved additional consideration; that new methods for fiber identification are needed; that work on casein selection, casein substitutes, spreadability of coating mixture and permanence and durability of papers should be pushed; and that better co-operation both from within the industry and from the users of its products is needed.

T.A.P.P.I. Officers Elected

Mr. Sutermeister's remarks were followed by the election of officers. The slate was read by R. C. Griffin, chairman of the nominating committee and unanimously adopted by the association.

The officers as elected for the ensuing year are as follows:

President—C. C. Heritage; **Vice President**—Grellet N. Collins; **Secretary**—R. G. Macdonald.

Members of the Executive Committee—C. C. Heritage, Grellet N. Collins, Otto Kress, W. R. Maull, E. O. Reed, Helen U. Kiely, Henry P. Carruth, A. E. H. Fair, Albert Bankus and W. J. Lawrence.

Mr. Heritage in expressing thanks for his re-election called attention to the 1935 program; to the broadening responsibility of the work of the association; and suggested that the association can do collectively what it would be impossible to do individually.

He then mentioned (as he had done in his presidential address) that the 1935 fall meeting of T.A.P.P.I. would probably be held during the third week in September at Atlantic City, N. J., as guests of the Delaware Valley Section of T.A.P.P.I.; after which he introduced S. L. Willson, president of the American Writing Paper Co., as the next speaker.

Other Luncheon Speakers

Mr. Willson, after giving a few interesting sidelights on the history of papermaking, called attention to the research activities of the Federal Government through the Bureau of Standards and the Forest Products Laboratory as well as the research of the individual mill and other agencies. He mentioned the growth of the paperboard and other branches of the industry and suggested that we may be entering a new era.

In concluding his remarks, Mr. Willson thanked the officers and members of T.A.P.P.I. for their co-operation during the days of his leadership of the American Paper and Pulp Association.

Captain Joseph Battley, Divisional Administrator in Charge of the Paper and Pulp Industry, made a brief plea in support of the codes. It was his feeling that unless N.R.A. is given a good trial by industry that industry will suffer. He stated that we must have progress regardless of what is heard concerning technology and unemployment and, in conclusion, suggested that the function of N.R.A. is to give service and to co-operate with industry.

Ernst Mahler, Vice President of Kimberly-Clark Corporation, then reviewed the work of the past year or so by the Central Grading Committee of P.I.A. He said that the industry was greatly indebted to T.A.P.P.I. in setting up standard methods and technique for this work on grading as well as for help in the selection of personnel of the grading committees. He also pointed out that adequate instrumentation was one of the needs of the industry.

Stuart B. Copeland, Vice-President of the Eastern Manufacturing Company and President of the United States Pulp Producers Association, commented briefly upon Pulp as an International Commodity. He reviewed the increase of domestic pulp production to the peak of 1929 and the decrease since then; and suggested that one of the industry's greatest hazards lies among some domestic pulp purchasers who aim to slash pulp prices. He stated that foreign producers of pulp were observing our code and commended them for it.

The last speaker on the luncheon program was F. J. Sensenbrenner, President of the Kimberly-Clark Corporation and newly elected president of the American Paper and Pulp Association, who made a few well chosen and optimistic remarks upon business conditions prior to the meeting adjournment.

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◆ National Paper Trade Association Meeting

The thirty-second annual convention of the National Paper Trade Association of the United States, whose membership comprises the leading paper jobbers and merchants of the country, held forth for four days, February 18-21, in the Waldorf-Astoria Hotel, New York, simultaneously with the A. P. & P. A. and T. A. P. P. I. conventions. Heretofore, the National Association's conventions were confined to three days. This year's gathering was exceptionally well attended, paper dealers from numerous sections of the country flocking to New York to be present at the sessions of the several divisions of the merchants' association.

At the annual business meeting and election of officers, H. L. Zellerbach, of the Zellerbach Paper Company, San Francisco, Cal., was elected president for the ensuing year, succeeding A. W. Leslie, of the John Leslie Paper Company, Minneapolis, Minn. O. F. Marquardt, of Marquardt & Co., New York City, was elected vice president in charge of the Fine Paper Division; F. Bendel Tracy, of the Fort Hill Paper Company, Boston, Mass., vice president in charge of the Wrapping Paper Division, and Charles Addoms, of the Miller & Wright Paper Company, New York City, was again chosen treasurer, a post he has occupied for many years.

The Code Authority of the National Paper Trade Association elected follows: To represent Region 1—F. Bendel Tracy; Region 2—O. F. Marquardt; Region 3—Sidney Wellhouse; Region 4—George Cobean; Region 5—Ralph Beckwith; Region 6—Sidney Strauss; Region 7—H. L. Zellerbach. The two members of the Code Authority to represent non-members of the trade are H. B. Finch and Thomas J. Nagle. The two members who take office for the first time are Messrs. Tracy and Beckwith.

The Executive Committe for the Fine Paper Division and the Wrapping Paper Division, which gets its authority from the Board of Directors of the National Paper Trade Association and operates for the Board of Directors, includes the officers and the following: N. A. Considine, Allen Chadwick, F. W. McCarthy and E. P. Magel.

◆ Mill Supply Dealers Banquet

Attendance was the largest since 1921, and only a minor number short of establishing a new high record, at the twenty-seventh annual banquet and entertainment of the New York Association of Dealers in Paper Mill Supplies, Inc., in the East Ballroom of the Commodore Hotel, New York, on the evening of February 20. Included in the 300 or more Association members and guests present were many paper and board mill representatives, mostly mill purchasing agents who were the guests of the supply merchants.

An excellent seven-course dinner was served, following which a lengthy stage show was presented, lasting nearly three hours. In the array of talented performers were vocalists, instrumentalists, dancers, comedy teams and others, recruited from among the best known New York night clubs and vaudeville groups, and act after act was put on and brought vociferous applause from the audience. A feature of the entertainment was two dialect monologues by Harry Beller, a paper stock dealer connected with the Sterling Mill Supply Company, Inc.

Walter H. Martens, of George W. Millar & Co., Inc., and president of the association, was chairman of the Banquet Committee, assisted by William C. Steck, Joseph P. Gaccione, M. Kay, Julius Levine and Frank Valva. An attractive souvenir journal and program was published and distributed at the banquet.

◆ Machinery Manufacturers Association

Phillips Dennett, of the Bird Machine Company, was re-elected president of the National Association of Manufacturers of Paper and Pulp Machinery and Equipment at the annual meeting of that organization in the Waldorf-Astoria Hotel, New York, on February 20. Charles L. Bauer, of Bauer Bros., was re-elected vice president, and W. B. Wilshusen, of the Cameron Machine Company, was again chosen treasurer. These officers and the following comprise the Board of Directors elected: J. E. Waterhouse, Montague Machine Company; A. B. Clark, J. O. Ross Engineering Corporation, and S. G. Bevis, Bevis Machine Company.

The meeting was fairly well attended, and various subjects were discussed.

◆ Nils R. Johaneson Re-Elected President of American Wood Pulp Importers Ass'n

At the annual meeting of the Association of American Wood Pulp Importers, held at the Waldorf-Astoria Hotel on February 7, the following officers were elected for the ensuing year: President, Nils R. Johaneson, of Johaneson, Wales & Sparre, Inc.; Vice President, Edward E. Barrett, of The Mead Sales Co., Inc.; Treasurer, J. A. Millar, of the Perkins-Goodwin Company; secretary, Harry Dixon, of Johaneson, Wales & Sparre, Inc., 250 Park Avenue, New York.

Affiliated Groups Draw Large Attendance

At the annual meeting of the Writing Paper Manufacturers Association, I. N. Esleeck, of the Esleeck Manufacturing Company, Turners Falls, Mass., was elected president, succeeding Harrison R. Baldwin, of the Hammermill Paper Company, Erie, Pa., and J. L. Bagg, of the Millers Falls Paper Company, Millers Falls, Mass., and F. H. Savage, of the International Paper Company, New York City, were elected vice presidents. Emmet Hay Naylor was again named secretary and treasurer.

The Executive Committee for 1935 consists of the president and vice presidents and Harrison R. Baldwin, Hammermill Paper Company, Erie, Pa.; Norman Bardeen, Lee Paper Company, Vicksburg, Mich.; D. K. Brown, Neenah Paper Company, Neenah, Wis.; W. M. Crane, Jr., Crane & Co., Inc., Dalton, Mass.; H. F. Harrison, West Virginia Pulp & Paper Company, New York City; H. H. Howard, The Howard Paper Company, Urbana, O.; W. S. McClellan, P. H. Glatfelter Company, Spring Grove, Pa., and H. A. Moses, Strathmore Paper Company, West Springfield, Mass.

This was the seventy-fourth annual meeting of the Writing Paper Manufacturers Association. Prior to the close of the meeting, retiring president Baldwin was presented with a large case of flat silver by his many friends among writing paper manufacturers. The presentation was made on behalf of his friends by Walter J. Raybold, of the Rising Paper Company, Housatonic, Mass.

Book Paper Manufacturers

George H. Mead, of The Mead Corporation, Chillicothe, O., was re-elected president of the Book Paper Manufacturers Association at the annual meeting held in the Jansen Suite of the Waldorf-Astoria. P. H. Glatfelter, of the P. H. Glatfelter Company, was re-elected treasurer. Hugh Chisholm, Oxford Paper Company, was named as the representative on the Board of Governors of the American Paper and Pulp Association, succeeding George H. Mead. Last year Mr. Chisholm served as the alternate member. The new alternate named is G. K. Ferguson, of the Watervliet Paper Company. Directors for two years elected are George H. Mead, The Mead Corporation; R. D. Smith, S. D. Warren Company; G. K. Ferguson, Watervliet Paper Company; P. H. Glatfelter, P. H. Glatfelter Company; Logan G. Thomson, Champion Coated Paper Company; W. T. Schmitt, Bryant Paper Company; J. N. Bergstrom, Bergstrom Paper Company, and J. S. Sensenbrenner, Kimberly-Clark Corporation. Directors for three years are J. R. Miller, West Virginia Pulp & Paper Company; C. A. Gordon, Oxford Paper Company; J. H. Fearing, International Paper Company, and A. E. Curtenius, Kalamazoo Paper Company. C. G. Parker is managing director of the Association, and C. L. Barnum assistant managing director. Richard S. Berry is secretary and assistant treasurer.

Waterproof Paper Manufacturers

At the annual meeting of the Waterproof Paper Manufacturers Association, Frank D. Donavon, of the United Paper Company, East Braintree, Mass., was chosen president, succeeding Fred P. Wood, of the Simplex Paper Corporation, Adrian, Mich., and A. M. Anderson, of the Sisal Kraft Company, New York City, was elected vice president. The above officers, together with retiring president Wood; Henry W. Stark, Rexford Paper Company, Milwaukee, Wis., and George Chadwick, W. Ralston & Co., Niagara Falls, N. Y., compose the Executive Committee for the coming year. Douglas A. Crocker was re-elected secretary-treasurer, and Louis Siegel was made assistant secretary. All the officers automatically become members of the Code Authority, with Frank E. Donavon chairman, and A. M. Anderson vice chairman.

Kraft Paper Association

L. C. Anderson, of the Sorg Paper Company, Middletown, O., was elected president at the annual session of the Kraft Paper Manufacturers Association, succeeding H. W. Ellerson, Albemarle Paper Mfg. Company, and J. L. Stille, of the Southern Kraft Corporation, was elected vice president. The Executive Committee chosen for 1935 is composed of William H. Anders, J. N. Harvey, C. R. McMillen, John Miller, N. S. Stone, J. MacDonald, J. C. Stansbury, Norman Brown, H. E. Goodyear and H. W. Ellerson.

Newsprint Manufacturers

The Association of Newsprint Manufacturers of the United States elected A. L. Hobson, of the St. Croix Paper Company, Woodland, Me., chairman for the ensuing year as successor to Edgar Rickard, of the Pejepscot Paper Company, Brunswick, Me. C. H. Blandin, Blandin Paper Company, and J. D. Zellerbach, Crown-Zellerbach Corporation, were elected vice chairmen. The Advisory Committee consists of A. R. Graustein, International Paper Company, New York City; Edgar Rickard, Pejepscot Paper Company; R. H. M. Robinson, Minnesota & Ontario Paper Company, and W. S. Wyman, Maine Seaboard Paper Company.

Cover Paper Manufacturers

R. S. Madden, of the American Writing Paper Company, Holyoke, Mass., was again chosen president of the Cover Paper Manufacturers Association at the yearly meeting of that group; J. B. Shepherd, Peninsular Paper Company, Ypsilanti, Mich., was elected vice president, and Emmet Hay Naylor was re-elected secretary and treasurer. The Executive Committee elected is composed of President Madden, Vice President Shepherd; G. H. Beckett, The Beckett Paper Company, Hamilton, O.; A. E. Frampton, Hammermill Paper Company, Erie, Pa., and J. B. Van Horn, Holyoke Card & Paper Company, Springfield, Mass.

American Waxed Paper Association

The American Waxed Paper Association elected the following Executive Committee to serve during 1935: Vasco E. Nunez, Nashua Gummed and Coated Paper Company, Nashua, N. H.; Van H. Wilshire, Specialty Papers Company, Dayton, O.; R. B. Donnelly, Central Waxed Paper Company, Chicago; William J. Eisner, Newark Paraffine and Parchment Company, Newark, N. J.; Walker Hamilton, Riegel Paper Company, New York City; Howard Larsen, Crystal Tissue Company, Middletown, O.; Stuart Moore, Dixie Waxed Paper Company, Dallas, Tex.; H. O. Nichols, Western Waxed Paper Company, Portland, Ore.; Preston E. Roberts, Mid-West Waxed Paper Company, Fort Madison, Ia.; Russell Buhrer, American Bread Wrapper Company, Chicago and New York City, and P. S. Fiske, secretary and manager, New York City. The Association will elect officers for the ensuing year in April.

Specialty Paper and Board Affiliates

At the annual meeting of the Specialty Paper and Board Affiliates, general business conditions were discussed and a slight change was made in the Constitution at the request of the Administration. Louis Vose, of the Hollingsworth & Vose Company, East Walpole, Mass., was elected president, and Clark Morian, of the Cherry River Paper Company, Richwood, W. Va., vice president. Col. B. A. Franklin, of 95 State street, Springfield, Mass., is secretary.

Sulphite Paper Manufacturers

Rufus L. Sisson, Jr., of the Racquette River Paper Company, Potsdam, N. Y., was elected chairman of the Sulphite Paper Manufacturers Association at the annual meeting of that organization. George Stuhr, Continental Paper & Bag Company, New York City, was elected vice chairman of the Unbleached Division; Edgar W. Kiefer, Port Huron Sulphite & Paper Company, Port Huron, Mich., vice chairman of the M. G. Sulphite Division; Walter B. Merlin, Hollingsworth & Whitney Company, New

York City, vice chairman of the Manila Division, and Thomas A. Hendry, Fraser Industries, Inc., New York City, vice chairman of the Bleached Division. The Executive Committee elected is composed of George Stuhr, Thomas A. Hendry, Walter B. Merlin, and H. O. Nichols, of the Crown Willamette Paper Company. The Board of Governors consists of the following: John Alexander, Nekoosa Edwards Paper Company; D. C. Everest, Marathon Paper Mills Company; Thomas A. Hendry; Edgar W. Kiefer; Walter B. Merlin; George Stuhr; Clark H. Morian, Cherry River Paper Company, Philadelphia; Richard A. McDonald, Crown Willamette Paper Company, and Rufus L. Sisson, Jr.

U. S. Pulp Producers

The United States Pulp Producers Association held an interesting and well attended meeting, and elected the following Board of Directors: To represent the East, Norman Brown, The Brown Company; Stuart B. Copeland, Eastern Manufacturing Company, and Amor Hollingsworth, Penobscot Chemical Fibre Company. To represent the Lake States, J. M. Conway, Hoberg Paper & Fibre Company; Earl McCourt, Consolidated Water Power & Paper Company, and R. O. Warner, Minnesota & Ontario Paper Company. To represent the South, John Harvey, Southern Advance Bag & Paper Company; Reuben Robinson, Champion Fibre Company, and Ellis Olsson, Chesapeake Corporation. To represent the Pacific Coast, Ossian Anderson, Puget Sound Pulp & Timber Company; E. M. Mills, Ranier Pulp & Paper Company, and R. B. Wolf, Weyerhaeuser Timber Company. To represent the industry at large, Howard E. Beedy, Oxford Paper Company; Ralph Shaffer, Shaffer Pulp Company, and Norman W. Wilson, Hammermill Paper Company.

Cardboard Manufacturers Association

Lowell Emerson, of the Rhode Island Cardboard Company, Pawtucket, R. I., was elected president of the Cardboard Manufacturers Association at the annual meeting of that group, and Kendall Wyman, Champion Coated Paper Company, was elected vice president. The following Executive Committee was elected: Donald V. Lowe, Lowe Paper Company, representing the Box Board Division; Fred C. Heinritz, Appleton Coated Paper Company, representing the Coated Tag Division, and J. A. Moses, Falulah Paper Company, representing the Coated Blanks and Miscellaneous Cardboard Division.

Sulphate Pulp and Board

The annual meeting of the American Sulphate Pulp and Board Association was attended by members representing approximately 98 per cent of the production tonnage of the industry, and was devoted primarily to a review of developments of the past year and planning of activities for the coming year. The election resulted in the retention of most of the officers who served last year. A. C. Goodyear, of the Bogalusa Paper Company, New York City, was elected president; H. W. Ellerson, Albemarle-Chesapeake Corporation, Richmond, Va., vice president, and S. M. Hudson, New York City, secretary and treasurer. The Executive Committee elected is composed of Messrs. Goodyear and Ellerson, and H. Lutcher Brown, Brown Paper Mills Company; J. P. Hummel, Hummel-Ross Fibre Corporation; H. L. Wollenberg, Longview Fibre Company; D. C. Everest, Ontonagon Fibre Corporation; J. R. Miller, West Virginia Pulp and Paper Company; J. D. Zellerbach, National Paper Products Company, and R. J. Cullen, Southern Kraft Corporation.

Ground Wood Paper Association

C. R. McMillen retired as president of the Ground Wood Paper Association and C. H. Sage was elected for the ensuing year at the annual meeting of that Association. Thomas A. Hendry was elected eastern vice president; Walter L. Mead western vice president; R. E. Canfield executive vice president, and E. O. Merchant, New York City, secretary and treasurer. The following Board of Governors was named: East, T. A. Hendry, C. R. McMillen, W. N. Hurlburt and Samuel Pruyn; West, Walter L. Mead, C. H. Sage, J. H. Slater and L. L. Alsted; Pacific Coast, H. O. Nichols. The Board of Governors serves as the Executive Code Authority for the Ground Wood Division.

Paper Napkin Manufacturers

The National Association of Paper Napkin Manufacturers, having headquarters in Philadelphia, held executive meetings on Monday and Wednesday of paper convention week and an industry gathering on Tuesday at the Waldorf-Astoria. Grafton Huston, of the Fort Howard Paper Company, is the new chairman of the Code Authority elected, and Morris Housen, Erving Paper Mills, is vice chairman. Other newly-elected Authority members are L. W. Watson, Tuttle Press Company; Edward Dahl, Groff Paper Company; Russell A. Buhrer, Berst, Foster, Dixfield Company; C. A. Reed, C. A. Reed Company; Frank Broura, Menasha Paper Products, and Paul Graves, American Tissue Mills.

Paper Makers Ad Club

Meeting in the Carpenter Salon in annual session, the Paper Makers Advertising Club elected Orin R. Summerville, of the Beckett Paper Company, Hamilton, O., president; Edson S. Dunbar, Crocker-McElwain Company, vice president; Morris Park, Holyoke Card & Paper Company, treasurer, and Richard F. Linsert, American Writing Paper Company, secretary. A total of 24 representatives of the 22 member firms of the Club and 5 representatives of nonmember firms were present at the meeting.

Bristol Board Manufacturers

At the annual meeting of the Bristol Board Division of the paper and pulp industry, the following officers to serve as the Executive Authority for the coming year were elected: R. G. Westad, Waterfalls Paper Mills, Mechanic Falls, N. Y., chairman; Rufus I. Worrell, Wheelwright Papers, Inc., vice chairman; James B. Ramage, Franklin Paper Company; Norman Harrower, Linton Bros. & Co.; S. Dillingham, West Virginia Pulp and Paper Company; Joseph E. Holmes, Chemical Paper Mfg. Company, and William R. Driver, Jr., New York City, secretary. The meeting voted to approve the budget for the fiscal year from February 1, 1935, to January 31, 1936, as presented by the secretary. The subject of trade customs was considered at length with an aim to clarify and amend same where necessary.

Glassine and Greaseproof Manufacturers Association

Robert F. Nelson, of the Glassine Paper Company, was re-elected chairman of the Executive Authority of the Glassine and Greaseproof Manufacturers Association, and other members elected were Paul E. Hodgdon, Deerfield Glassine Company; Folke Becker, Rhinelander Paper Company; Carl Stansbury, Thilmany Pulp & Paper Company, and John L. Riegel, Riegel Paper Corporation. Richard C. Staelin, of New York City, is secretary of the Association.

Blotting Paper Manufacturers

At the annual meeting of the Association of Blotting Paper Manufacturers, D. A. Smith, of the District of Columbia Paper Mfg. Company, Washington, D. C., was re-elected chairman, and Henry Mead, of the Wrenn Paper Company, Middletown, O., vice chairman. These two officers and James Ryland of the Standard Paper Mfg. Company, Richmond, Va., compose the Code Authority for the blotting paper industry.

Tissue Paper Manufacturers

Z. W. Ranck, of the Crystal Tissue Co., Middletown, Ohio, was elected president of the Tissue Paper Manufacturers Ass'n succeeding Leslie G. Wood, of the Northern Paper Mills, Green Bay, Wis. Frank Vaughn, of the Bay West Paper Co., was elected vice president, and B. F. Picola was re-elected treasurer.

The following were elected chairmen of the several groups in the Association of Manufacturers and Converters of Tissue: George Dunn, Dunn Sulphite Paper Company, Port Huron, Mich., chairman Jumbo Roll Group; Bert I. Reider, Victoria Paper Mills, Fulton, N. Y., chairman Roll Toilet Paper Group; A. B. Lowenstein, National Paper Products Company, chairman Cuterfold Toilet Tissue Group; Eli Meyers, Sterling Paper Company, Tampa, Fla., chairman Fruit Wrap Group, and Z. W. Ranck, Crystal Tissue Company, chairman Wrapping Tissue Group.

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◆ AT A MEETING of the Executive Committe of the Pulp and Paper Section of the National Safety Council, held in Chicago January 24, it was voted to hold the next Annual Safety Congress at Louisville, Ky., October 14 to 18, 1935.

Salesmen's Association Hears Stirring Addresses

MEMBERSHIP of the Salesmen's Association of the Paper Industry showed great expansion last year, increasing from a total of 99 to 186, or very nearly double, as a result of a concerted membership drive, it was reported at the annual meeting of the association on February 19 in the Carpenter Salon of the Waldorf-Astoria Hotel, New York. The meeting was well attended, and an atmosphere of enthusiasm pervaded the session. President William L. Raymond, of the P. H. Glatfelter Company, presided, and on opening the meeting invited the two vice presidents, R. C. Johnson, of the Northwest Paper Company, Chicago, western vice president, and J. K. Hutchinson, Jr., of the Allied Paper Mills, New York, eastern vice president, to sit on the rostrum with him, which they did.

President Raymond reported that at the Executive Committee meeting the day before a resolution was adopted thanking the A. P. & P. A. for its great assistance in getting out the Salesmen's weekly bulletin during the past year. He also reported that overtures had been made by a Pacific Coast group of mill sales representatives proposing to join the Salesmen's Association, and that if the negotiations were successful, the membership of the association would be increased numerically by another 55 or thereabouts. The suggestion was made that should the Pacific group come into the association, the divisional set-up of the organization be changed to embody the Atlantic States, Lake States and Pacific States Divisions. A motion was passed that the Pacific Coast salesmen be advised the Association is deeply desirous that they join the organization.

President Raymond announced that Dr. E. O. Merchant had accepted the secretaryship of the Salesmen's Association, and will edit the weekly bulletin, and the announcement was received by the members with applause. A resolution was adopted petitioning the Board of Governors of the A. P. & P. A. to simplify and standardize trade customs and practices now in force.

President Raymond's annual address reviewed the activities of the Association during the past year, and made some recommendations for the future. Referring to the last year, he said: "Never before has any period been so full of interesting problems, conflicting rumors, revisions in procedure, nor have we ever been confronted with as great a necessity for keeping constantly up-to-date, for closer attention to minute details or a more exact knowledge of our industry.

"The co-operative agencies set up by the Code of Fair Practices supplied us with the means with which to attack these problems. We have availed ourselves of these means and, consequently, it is now a fact that many of our hopes have been realized—perhaps not to the fullest degree but at least to a sufficient extent that we view present conditions with far greater satisfaction than we have those of the past five years.

"But the fight has really just begun. The anticipated antagonism of the chiseling buyer to orderly procedure of honest merchandising is, unfortunately, the fact. We salesmen must still be constantly on our guard to counteract subterfuge, substitution, and the oft repeated phrase, 'I can get it cheaper from another mill.' In the large majority of cases the buyer cannot get a concession from another mill but he uses this misstatement as well as other means to find a weak spot in our armor to gain some advantage over his competitors.

"In some cases it is true that the unscrupulous buyer has been able to make good his threat. The various agencies established by the Code are constantly endeavoring to reduce these cases to a minimum. We can help reduce the number by being sure our own actions are above reproach, and, above all, by avoiding a policy of 'doing it because the other fellow does it.' Such a policy brought about such chaotic conditions in the not far distant past that all the resistance possible should be exerted to prevent their recurrence.

"It is a very difficult assignment to sum up the results of the last sixteen months, particularly as there are so many cross currents of opinion among the leaders, both in governmental and industrial circles. The consoling factor, however, is contained in the word *Progress*. We salesmen who have been on the firing line of business for the last year have the greatest respect for our General Staff, the PIA, and for our own ranking officers in our own individual companies. We have been realizing the tremendous problems that the entire paper industry has been facing and are convinced that the industry has made excellent progress in this Battle for Business Recovery.

"Perfection cannot be achieved overnight nor can perfection be gained by legislation alone. It must be augmented by an intensive program of education. It is in this work that we salesmen can perform a signal service to the industry as a whole and to our own companies individually."

When President Raymond had completed his annual address, George K. Gibson arose and stated that he regarded it as one of the most comprehensive and impressive he had ever heard delivered before the Salesmen's Association, and offered a motion that the address be printed and a copy sent to each association member. The motion was adopted. Mr. Gibson is a former president of the association.

Vice Presidents Johnson and Hutchinson reported for their respective divisions, telling of the weekly luncheon meetings held in Chicago and New York during the past year, and the results accomplished.

Creighton W. Whiting, American Writing Paper Company representative at Chicago, was elected president of the Salesmen's Association for 1935, and Charles J. Slicklen, of the Brown Company, was elected vice president in charge of the Eastern Division, while R. C. Johnson, of the Northwest Paper Company, was re-elected vice president in charge of the Western Division. The election was unanimous, there being no opposing candidates nominated.

The annual luncheon of the Salesmen's Association, which was held in the Grand Ballroom of the Waldorf-Astoria immediately following the annual meeting, was one of the happy social events of the A. P. & P. A. convention. More than 500 attended, and were seated at round tables accommodating ten each. The guest and speakers table was on the stage of the ballroom.

President Raymond acted as toastmaster, and the principal speaker was Hon. John Dickinson, Assistant United States Secretary of Commerce, who spoke on the subject "Recovery vs. Demagoguery." Demagogues who appeal to passion and prejudice in an effort to discredit the Roosevelt administration and gain power for themselves were condemned by Secretary Dickinson. The administration, at first charged with hostility to business, he said, is now being accused of being too friendly to business. But the administration has insisted from the beginning, he declared, that "recovery means a revival of business activity based upon private initiative and enterprise."

The Secretary spoke at much length on the efforts put forth by the Roosevelt administration to aid business, and defeat the depression, and cited statistics to show to what extent industrial improvement has thus far been effected. "The policy of the administration has been a complicated and tentative one, resting upon a sober attempt at economic analysis and constructive statesmanship," he said. "The effort has been to bring about balance and to go only so far in any given direction as is needful to correct some undue development in another direction."

Secretary Dickinson was introduced to the audience by George H. Mead, of The Mead Corporation, and vice president of the A. P. & P. A., who spoke briefly prior to the principal speaker. Sidney L. Willson, retiring president of the A. P. & P. A. also spoke, and stated that there are no codes in existence from which better results have been obtained than those of the paper

industry. He believed that after the emergency period "voluntary continuance" of the codes of fair competition would be favored by a large majority of the industry.

W. W. Pickard, co-ordinator of the paper industry, was called upon by President Raymond, and waxed so humorous in his remarks that he had the entire assemblage laughing and applauding loudly. Among other things, he said: "When I was here a year ago I was Deputy Administrator; now I am called the Co-ordinator. Probably some of you wonder what the co-ordinator is. You have nothing on me."

The toastmaster also introduced the newly-elected president of the Salesmen's Association, Creighton W. Whiting, to the audience.

The association committee having charge of the arrangements for the annual luncheon was composed of Dr. E. O. Merchant, E. G. Lloyd, E. R. Lyman, W. W. Langtry, J. A. Leyden, C. J. Slicklen, and A. B. Helffrich, chairman.

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◆ To Revise Pulp and Paper Books

The Joint Textbook Committee has decided to proceed at once with the revision of the industry's textbook that was proposed in 1932, but postponed because of the uncertain conditions at that time, and because of the many developments that were then in process of adoption. In co-operation with the publishers, the McGraw-Hill Book Company, the Committee will revise Volumes III, IV, and V of *The Manufacture of Pulp and Paper*, originally published in 1922-25, and last revised 1927-9. The editor's plan, as approved by the authors of the various sections, and the leaders of the Technical Association of the Pulp and Paper Industry and the Technical Section of the Canadian Pulp and Paper Association, is as follows: Committees are asked to review the sections of the books with which they are particularly concerned, and advise the editor of changes that should be made.

It has been suggested that the criticism of the present text should be on a broader basis in order to assist those committees. Readers of this magazine are therefore requested to read over the parts of the textbooks dealing with their particular departments, with regard to the following points: (1) to indicate portions that because of obsolescence or otherwise could be omitted without serious effect on the educational or reference value of the work; (2) to indicate what portions could be condensed, and how; (3) to note points in the text where improvement in equipment or process requires rewriting to make it agree with present practice; (4) to suggest new material that should be included as a result of recent developments in equipment and operation; (5) to correct errors in the present text.

Recommendations, with information or sources of same, should be sent as soon as possible to the editor, J. N. Stephenson, at Gardenvale, Que.

There is a tremendous amount of work to be done. Volume III is nearly out of print and the revision of this Volume is being pushed as rapidly as possible. Any assistance will be welcome. There may be duplication of suggestions, but this will only emphasize their importance.

◆ Many Imports Incorrectly Classed as Newsprint

The Import Committee of the American Paper Industry has disclosed a large number of cases in which importers are endeavoring to secure admission duty free as standard newsprint of paper not chiefly used by newspapers. Among these cases are the following:

On the Pacific Coast a newspaper publisher who is beginning to use paper in 15½ inch rolls claims the paper is standard newsprint duty free.

A syndicate printer of newspaper comic supplements is planning to print such supplements for his newspaper customers from 15 inch width paper which he plans to import from Canada duty free as standard newsprint.

A printer of a rotogravure supplement for an American newspaper is importing high gloss paper on the claim that it is standard newsprint duty free. The gloss is higher than that provided in the definition of standard newsprint.

Paper of 50 per cent sulphite content in sheets is being imported into Puerto Rico as standard newsprint duty free, but when classified as dutiable printing paper the case was carried to the Customs Court for determination.

Two cases have been tried on the Pacific Coast in which importers claimed their shipments were standard newsprint duty free. One involved paper with 40 per cent sulphite, used by weekly publications at Los Angeles. The other was of paper with a high percentage of bleached sulphite imported from Japan for use at San Francisco for other than newspaper publication.

Investigation is under way as to the reported imports of paper containing bleached ground wood as standard newsprint. No such paper was used by newspapers when the present Tariff Act was passed.

The Import Committee is taking every step possible in each of these cases to protect the interests of the domestic manufacturers. Action being taken varies according to the conditions involved in each of the problems, but no effort will be spared to check the foreign competition in these as well as in other grades of paper.

The test case on the valuation of Swedish M. G. Kraft wrapping paper, initiated in 1931 through the efforts of the Import Committee has finally been decided by the highest Customs Court in accordance with the position taken originally by the Import Committee. The complaint of undervaluation of the Swedish paper was decided favorably to the importer by the United States Customs Court in 1932, but was appealed to the United States Court of Customs and Patent Appeals. That Court reversed the lower Court in May last, but the importer petitioned for a rehearing. The Court has finally ruled against a rehearing application, and the finding of undervaluation stands. It will affect all importations of this paper for the past four years, involving several hundred separate shipments.

During January thirty-five new cases involving various papers from wrapping to cigarette and writing were initiated, in which the importers are believed to have misclassified or undervalued their shipments. The value of the paper involved in these cases is upward of $100,000. During the same month importers abandoned cases which they had appealed to the Customs Court involving papers to a value of about $25,000, thus admitting that there had been misclassification or undervaluation or both.

◆ Trimbey Machine Works Gets Nice Orders

The Trimbey Machine Works, Glens Falls, N. Y., reports that during the months of December, January and February repeat orders were received from five paper mills for eight groundwood screens, one mill on the Pacific Coast placing a repeat order for three screens.

The Trimbey company also has on order for March shipment, 4 Trimbey regulators for shipment to China, one to England; and three Trimbey weight regulating stuff boxes to England.

◆ THE OHIO FORGE and Machine Corp., Cleveland, Ohio, successors to Gears & Forgings, Inc., manufacturers of gears, speed reducers, forgings and special machinery, announce the appointment of The Denton and Anderson Company, 1225 West Washington Blvd., Chicago, as its representatives in the Chicago territory.

◆ J. H. Miller Made Treasurer of Whiting Plover

At the annual meeting of Whiting-Plover Paper Company, on February 5, J. H. Miller was elected to the office of treasurer. E. A. Oberweiser, president, had formerly held both positions.

Mr. Miller's promotion marks the end of 25 years' of service with Whiting-Plover, interrupted only by military service during the war. He began as a stenographer with the company in 1910, and in the intervening years rose steadily to the position of manager, which he has held for the past several years, and which he will continue to fill concurrently with the treasurer's place.

Possessed of a keen, analytical mind, Mr. Miller's forte is the actual manufacture of writing papers, but his interest and authority extends over merchandising as well. He was in charge of advertising during the period when Whiting-Plover began its development of Mill Brand papers, relinquishing that activity only with the formation of a department to take over that work.

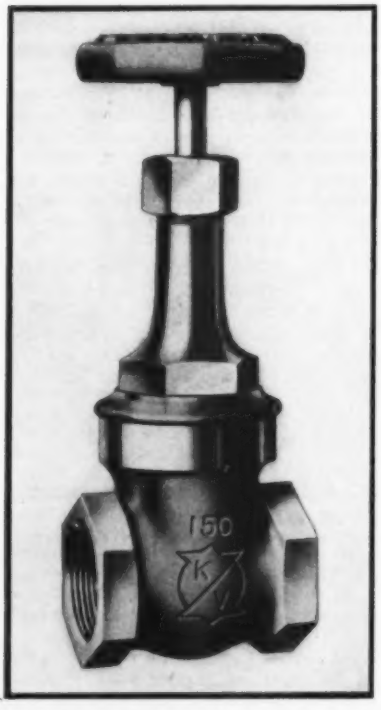
The other officers of the company remain the same: President, E. A. Oberweiser; Vice President, F. B. Whiting; Secretary, George Hilton.

◆ Rising Stem Gate Valve

The Kennedy Valve Manufacturing Company, Elmira, N. Y., has placed on the market a new line of rising stem heavy standard bronze gate valves for 150 pounds working steam pressure and 250 pounds working water, oil or gas pressure.

This valve, known as Fig. 45, is a companion type to the Fig. 23 with stationary stem which was introduced some months ago. The operating mechanism employs solid wedge discs which are simple, heavily proportioned and accurately machined, and with no small quick-wearing parts which might cause trouble in service.

A flexible connection is provided between the disc and the stem so that the stem will not bind or spring when the valve is closed. The stem is made of a bronze composition with high tensile and torsional strength, and has a number of contact threads in the bonnet.



Additional features cited for this new Kennedy design are a deep stuffing box with gland and square section molded packing rings, a large non-heating malleable-iron hand wheel which is secured to the stem by a nut, and heavy, wide pipe-end hexagons with generous number of threads.

◆ Tool Refacing Electrode

A new arc welding electrode which is designed for restoring worn cutting edges on tools of all kinds has been announced by The Lincoln Electric Company, Cleveland, Ohio.

This new electrode, known as "Toolweld", is covered with a coating which, as it is consumed in the arc, shields the arc from the atmosphere and prevents the formation of oxides and nitrides in the weld metal. This coating also helps to steady the arc and insures a smooth uniform weld deposit—a deposit which is equivalent to high speed tool steel and which has the advantage of retaining its hardness (55 to 65 Rockwell C) up to approximately 1000 degrees Fahr.

The electrode is made in 14-inch lengths and in four sizes—$\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{32}$, and $\frac{3}{16}$ of an inch.

◆ New Hand Lift Truck and Skid Platform

The Yale & Towne Manufacturing Co., Philadelphia Div., Philadelphia, Pa., has introduced a new hand lift truck which has been designated as the Yale Zephyr and designed for the handling of loads up to 1000 pounds. The width of its

frame is 18 inches, the lift 2 inches, the ground clearance 1⅞ inches, but rear wheels 5½ in. diameter x 2 in. face, and the front wheel 5 in. diameter x 2 in. face. Hyatt roller bearings and a ball bearing swivel caster makes for ease of operation, while a conveniently placed treadle controls the lifting and lowering mechanism. A reinforced steel plate welded between the side rails provides a deck which will permit the handling of loads with or without skid platforms. Such loads may be pushed or pulled with the truck handle locked in vertical position or they may be pulled with the handle extended to the normal pulling position.

A companion product to this truck that has also been announced is the Yale Featherweight skid platform. This platform, with underclearances of 6½ in., 7½ in. and 9½ in., is built in sizes from 24 inches to 36 inches in width and from 24 inches to 60 inches in length. In this design of platform, the legs are welded to the deck angles and oak lumber is used for the deck.

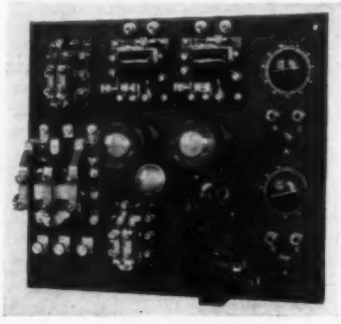
◆ Worm Type Powered Gear Hoist Unit

An interesting application incorporating a standard worm type powered gear in a compact hoist unit was recently engineered by Foote Bros. Gear and Machine Company, 5301 South Western Boulevard, Chicago. The unit consists of a standard type HGM worm type powered gear unit with a solenoid brake mounted on the extended worm shaft and a grooved drum on the slow speed gear shaft. The simplicity and compact arrangement of this hoist make it adaptable for many applications.

◆ Automatic Repeat Process Timer

A new automatic repeat process timer, built in four standard sizes and designed for operation on 110, 220, 440 or 550 volt circuits of any frequency, has been announced by The Electric Controller & Manufacturing Co., Cleveland, Ohio.

This timer operates on the principle of the time required to charge a condenser. It provides a quick, convenient



means for closing an electrical circuit for a definite length of time and then opening the circuit for a similar or different time as desired, and repeating this cycle of operation as long as the control push button or master is closed. Both the power-on and the power-off are independently adjustable to give the time desired.

◆ New Boiler Meter

Bailey Meter Company, Cleveland, Ohio, has developed a new steam flow —air flow boiler meter for industrial service.

Steam flow from the boiler, air flow supplied for combustion and flue gas temperature are recorded by this meter on one 12-inch diameter uniformly graduated chart. It also indicates steam flow on a porcelain enameled scale and integrates the total steam flow on a 6-digit counter which reads like an automobile mileage register.

The meter is equipped with a direct-reading Bailey escapement type integrator; an accurate, sensitive air flow mechanism; a sturdy, dust and moisture-proof pressed steel casing suitable for flush front or surface mounting; and a simplified, powerful steam flow mechanism with interchangeable head chambers.

In operation, it is simply necessary for any boiler operator to adjust the boiler damper or fuel control until the records of steam flow and air flow coincide, one upon the other, on the meter chart. In addition to guiding the operator, the permanent records made by the meter are of infinite value to the engineer responsible for boiler operation.

The record of flue gas temperature which is given by this meter is check on the condition of the boiler baffles and on the efficiency of the heat transfer through the boiler tubes. It shows whether or not the heating surface is absorbing the maximum amount of heat possible at all times.

◆ Specially Designed Electric Truck

An electric truck, claimed to be the largest truck of its type ever built, was designed and manufactured by the Baker Industrial Truck Division of the Baker-Raulang Company, 2168 West 25th Street, Cleveland, Ohio, for the handling of rolls of paper to and from warehouse

storage. This truck has a lift in the clear of 180 inches, an overall height of 255 inches, and the capacity to handle a 4,000-pound roll 55 inches in diameter. It is claimed that the use of this truck increased the available storage space by about 20 per cent over other types of handling equipment.

◆ New Rubber Tape

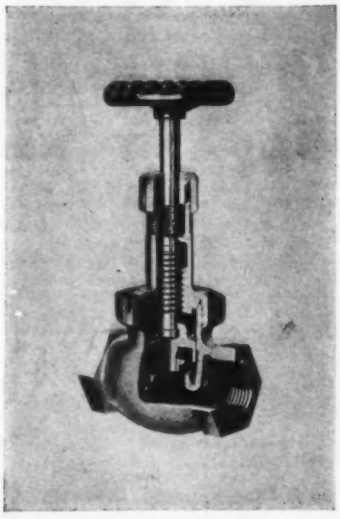
A new type of rubber tape to be known as Goodrich mending and electric tape has been announced by The B. F. Goodrich Company, of Akron, Ohio.

This tape, tested and listed by the Underwriters' Laboratories, is 90 per cent pure rubber. A single thickness has tested to 8,000 volts.

◆ Globe and Angle Valves

A new line of renewable bronze, angle and globe valves is being placed on the market by the Fairbanks Company, New York.

In this line of valves, the disc ring is composed of long-fibre asbestos which is compounded with vulcanizing elements and given a special cure; the disc holder is of standard dimensions so that other standard makes of disc rings can be used, if desired; the stem is of rolled rod bronze with at least five clean cut nut Acme threads in contact with the bonnet at all times; and the radial seat, be-



tween body and bonnet, is drawn to a tight joint by a union nut without sliding or scraping the surface of the seat. Likewise, all parts of these globe and angle valves are interchangeable.

◆ Straight Cutter Knife Grinder

A new straight cutter knife grinder has been developed by Samuel C. Rogers & Company, 191-205 Dutton Avenue, Buffalo, New York. This grinder, designated as Junior, is made in three sizes: No. 1 for knives up to 61 in. long; No. 2 for knives up to 76 in. long, and No. 3 for knives up to 84 in. long.

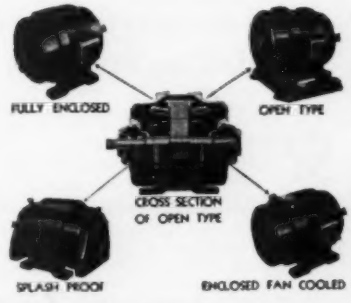
The bed of the grinder is a heavy one-piece casting with two parallel planed V-bearings for carriage traverse, knife bar supports and a cut steel rack. The carriage made up a bearing base, traverse wheel and pinion cross feeding slide with adjustable steel gib and steel motor plate swiveled for straight or

concave bevel grinding, supports a ⅓ hp., 1750 r.p.m. motor of any voltage or frequency desired and to which there is mounted directly on the shaft a 6-inch diameter free-cutting cup grinding wheel. This wheel is covered by a guard adjustable to its wear. The knife bar, supported by two end brackets on the bed of the grinder, is a heavy reinforced one-piece casting with a coolant reservoir. It is fitted with knife set up gauges and clamps for placing and holding a knife so that it may be ground to any degree of flat or concave bevel, the cut steel rack with pinion insuring steady smooth grinding. Cross feeding is effected by a small handwheel on a screw for moving the motor base which is gibbed to the lower part of the carriage.

◆ Convertible Motors

An entirely new line of convertible squirrel cage and slip ring induction motors, offering all standard frequencies for service ranging from 110 to 220 volts, has just been announced by the Harnischfeger Corp., Milwaukee, Wis.

The outstanding feature of these new motors is their ready convertibility from open type to fan cooled, splash-proof or totally enclosed construction. This is accomplished through the design of the frame, and heads and bearings to permit interchangeability in the



four above mentioned types of single or multi-speed squirrel cage and slip ring motors. Among other interesting features is the unique mounting of the stator laminations which are stacked between heavy steel and rings and the entire assembly then welded to the frame. The rotor windings are assembled from round or rectangular hard drawn copper bars which are placed in the rotor slots without insulation or slot wedges. The ends of the bars are brazed to the end rings by an electric arc torch.

◆ A Luminescent Paint

The Grobet File Corporation of America, 3 Park Place, New York City, is placing on the market a luminescent paint. This paint, known as Dialux and containing sulphur of calcium as its principal element, is made for both brush and spray applications on metal, glass, cloth, wood, hard rubber compositions, etc.

The chief value of this paint is stated to be the making visible of objects in complete darkness—a quality that is imparted to it by the sulphur of calcium. The sulphur of calcium, it is said, acts as an accumulator of light which it gives off, over a period of hours, in the dark and then upon being re-exposed to light, either natural or artificial, for only a few seconds is recharged.

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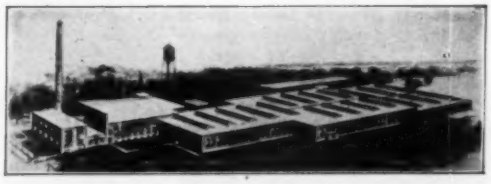

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Among the industrial applications for which Dialux has been suggested are fire extinguishers, hydrants, parts of machinery, electric apparatus, staircases, and dangerous dark corners.

◆ New Multiseal Gasket

Goetze Gasket & Packing Company, New Brunswick, N. J., has announced a new multiseal gasket which is designed to produce perfect tightness with only 30 per cent as much contact as required on a plain flat metal gasket. This is accomplished by providing the faces of the gasket with crossed, ductile and resilient raised ribs, which under very small bolt pressure, are said to set themselves into tight contact even on imperfect flange faces.

The gasket is available in solid copper, steel, Armco iron, aluminum or lead, or as a metal shell with asbestos filler, and in any circular, elliptical or special shape. It is suggested for application where there is temperature change and vibration and where extreme pressure must be withstood.

◆ C. C. VAN STRY, of the Cameron Machine Company, is now in England on an extended sales and service trip. While there, he will supervise the erection of the world's largest winder (310 in. wide) at the Kemsley Mills of Edward Lloyd, Limited. He will also inspect the new installation of the Type 18 Cameron Winder at the Thames Board Mills at Purfleet. This winder is 115 inches wide and rewinds rolls to 60 inches in diameter.

◆ IN ORDER to increase production without jeopardizing the high quality of its Zero Refractory Cements, the Standard Fuel Engr. Co., Detroit, Mich., has installed a new rotary dryer. All clays used in the manufacture of the Zero Cements are completely dried before being ground to the proper mesh.

◆ Syracuse Pulp and Paper Alumni Dinner

Alumni of the New York State College of Forestry, Syracuse, N. Y., who were in attendance at the recent Technical Association of the Pulp and Paper Industry convention, met for dinner on Wednesday evening, February 20, at Sacher's Restaurant, 301 Madison Ave.

Samuel N. Spring, Dean and Professor C. E. Libby, head of the Department of Pulp and Paper Manufacture, represented the college. Dean Spring, who was also the speaker of the evening, told of recent developments at the college that were of particular interest to this pulp and paper group.

The arrangements for the meeting were made by William R. Willets of the class of '25.

◆ AT THE ANNUAL meeting of the Detroit Sulphite Pulp & Paper Co., Joseph M. Ward was re-elected president; H. R. Telfer, vice president; J. H. Behnke, secretary; and L. Hulbert was elected treasurer.

◆ New Catalogues and Publications

Alexander Bros., Philadelphia — This company has just issued a new booklet covering its line of leather packings. The booklet is illustrated and contains price table as adopted by the Leather Packing Industry. Copies upon request.

Bailey Meter Co., Cleveland, O.—A new bulletin entitled Bailey Feed Water Regulators deals with thermo-hydraulic feed water regulators, lists distinctive features, diagrammatically illustrates the principle of operation by the thermo-hydraulic generator, and describes Bailey Regulating Valves of both tight seating and sleeve type construction. Data on Bailey excess pressure valves are also included and a tabulation of valve dimensions and a partial list of users complete the bulletin.

C. O. Bartlett & Snow Co., Cleveland, O. —This company's bulletin No. 74, Chains, Sprockets, Buckets, is available for distribution. Standard types of Detachable, Pintle, Ley Bushed, Combination, Drag, Roller, Transfer, Steel Bushed and Drop Forged Chain and Chain Attachments are illustrated, and the dimensions, weights, working loads and prices are given for each size. Eighteen pages are devoted to listings of prices and weights of sprocket wheels. Desirable information is given with regard to sizes, prices, etc., of shafting, collars, takeups, elevator buckets, and gears. Copies gratis.

Combustion Engineering Co., New York, N. Y.—A 16-page catalogue, No. E-8, describes this company's well known Type E, center-retort, underfeed stoker. This catalogue contains a complete description of every phase of the stoker's construction, operation and control. An introductory chapter on the economics of buying a stoker and numerous diagrams showing typical ash pit and air duct arrangements, as well as applications to various types of boilers, have been included.

General Electric Co., Schenectady, N. Y. —Compensated Selsyn Speed Regulators for Sectional Paper-machine Drives is the title of a new bulletin just released by this company. The application of these regulators and their operating features are very thoroughly but concisely, explained, and the bulletin contains several interesting illustrations.

General Refractories Company, Philadelphia—This company has prepared an interesting series of 10 booklets on its products and fields. There are four on products; namely, Fire Clay Brick, Plastic Fire Brick, Chrome Base High Temperature Cement (Grefco), and Fire Clay and Cyanite Base High Temperature Cements. Four booklets take up the uses of refractory products in certain fields; namely, Boiler Plants, Metallurgical Processes (Ferrous and Non-Ferrous), Oil Refineries, and Rock Products Industries. The other booklets are devoted to the company's sales offices, laboratories, southern products, etc. The complete series is printed in two colors, punched for binding, and the producer claims it is one of the most comprehensive outlines and references on refractories ever published by an individual manufacturer.

B. F. Goodrich Company, Akron O.—The 1935 issue of this company's Operators Handbook has just been published. Many new features are included in this year's volume. Among these are a page on Factors Governing Proper Tire Selection and a page on Load and Service Diagram, which illustrates effects of overloading on the ultimate service of a pneumatic tire. There are also chapters on Load Analysis, the Goodrich Tire Calculator, methods of determining tire cost per mile, etc. Another new folder issued by this company, lists 14 different improvements in belt construction which have been effected during the past five years.

W. & L. E. Gurley, Troy, N. Y.—Gurley Paper Testing Instruments is the title of Bulletin No. 1420, recently published. There are separate chapters on the Smoothness tester, Stiffness tester, Densometer, and Automatic Timing attachment for Gurley Densometers. There is complete descriptive matter accompanied by illustrations and data and prices. The booklet also contains complete instructions for operating Gurley paper testing instruments.

Jeffrey Mfg. Co., Columbus, O.—A new catalogue, No. 565, is devoted to the Jeffrey line of Bucket Elevators, which includes a type to meet every elevating requirement. In order to simplify selection the company has worked out a line of standards to meet the demands of various industries. The catalogue contains 111 pages, with a large number of layouts and diagrammatic illustrations, as well as many full-page halftones. There is a vast amount of data and valuable tables.

L. O. Koven & Brother, Inc., Jersey City, N. J.—This company has just issued its first catalogue covering special equipment designed and built to meet specific industrial needs. The catalogue has 52 pages and covers the entire range of plate and sheet metal construction in all commercial metals and methods of construction. It is divided sectionally with a definite treatment of each class of equipment in order that the user may have ready access to information of immediate interest. Under the section devoted to chemical and allied industries is shown some equipment for paper mill use. The catalogue is profusely illustrated and nicely bound.

Kropp Forge Company, Chicago—A Bulletin, Heat Treated Forgings, has just been received. It sets forth this company's ability to produce forgings to your specifications. The company's 96-page catalogue recently issued will be sent upon request. It is replete with data and information on this subject of forgings.

Link-Belt Company, Chicago—A 20-page catalogue covering the company's newly developed line of motorized speed reducers shows by means of an example how the proper reducer can be selected from the tables which give dimensions, capacity ratings, and speed ratios. Another publication of pictorial character (No. 1425), presents many types of applications of Silverstreak silent chain on both long and short centers. Copies on request.

Lunkenheimer Company, Cincinnati, O. —New literature from this company includes: a bulletin entitled Lunkenheimer Bronze Air Nozzles, with renewable nonmetallic discs, and another is devoted to Lunkenheimer Causul Metal Gate Valves.

Philadelphia Quartz Co., Philadelphia— A recent broadside gives detailed description of this company's new patented material known as Metso 99, which is pure Sodium Sesquisilicate. Paper-mill chemists will be interested in this new cleansing agent. Copies on request.

Springfield Boiler Co., Springfield, Ill.— A new catalogue, No. 35, covering this company's line of Water Tube Boilers, all steel sectional, is now available and will be sent on request. The book is profusely illustrated, and a feature of interest is a number of full page sectional drawings and diagrammatic illustrations illustrating the construction of the various types of units. At the end of the book is a page of Suggested Rules for Care and Operation of Power Boilers.

Standard Oil Company (Ind.), Chicago —A series of monographs is being prepared by this company's engineering department, for the purpose of presenting in plain terms and by striking illustrations a detailed analysis of every specific lubrication problem in each industry, and to give the solution conducive to maximum economy and efficiency. Of the several monographs already published, the following have application to the paper industry: The Lubrication Engineer . . . his Value to you; The Lubrication of Diesel Air Compressors; Diesel Engine Bearing Lubrication; and The Lubrication of Beaters and Jordans. Additional monographs will be published monthly during the year.

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◆ The Paper Industry in Japan Shows Gain in Production

According to *Side Runs of the Paper Trade*, Department of Commerce, the Japanese paper trade shared in the general industrial activity of the country during 1934. Production and sales of foreign-style papers exceeded the 1933 record, amounting to 795,739 short tons and 802,942 tons, respectively. These figures represent an increase in production of 73,687 tons, or 10 per cent, and 68,653 tons, or 9 per cent, over 1933. The high level of sales during 1934 was due almost entirely to the heavy demand for newsprint, wrapping paper and boards, the last two items reflecting the activity of the export trade.

The paper industry in Japan is one of the outstanding business monopolies, 90 per cent of the output being controlled by one firm. The industry is, however, one of those designated by the Government as a major industry to which the Industrial Control Law is applicable. By means of regulation of production, segregation of surplus stock, and price agreements, the one company which controls the trade has been able to increase its profits by raising prices a number of times since the reimposition of the Gold Embargo during the latter part of 1931. Early last year the Minister of Commerce and Industry warned the company to check the upward trend and to effect a more desirable equilibrium between supply and demand by releasing surplus stock and modifying the curtailment rate. Immediately following the official warning, the curtailment rate was reduced from 55 per cent to 50 per cent and later to 42 per cent on paper and from 55 per cent to 36 per cent on board. There was no curtailment on production of newsprint.

Imports of paper into Japan during 1934 amounted to 68,770 short tons, valued at 11,322,915 yen, an increase of 15,635 tons and 1,530,255 yen over 1933. The increase in receipts was due almost entirely to heavier imports of newsprint from Canada. Imports of packing paper also increased both in quantity and value, which would indicate that foreign firms are supplying Japanese exporters with their own packing paper in order to save the cost of repacking in their respective countries. No details of the country of origin of imports of paper during 1934 are yet available, but the trade of the United States with Japan in this article is relatively unimportant.

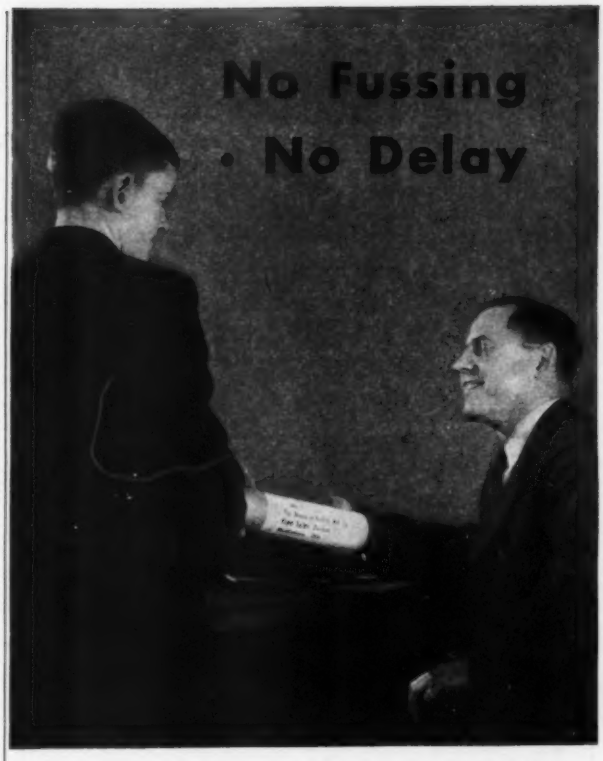
Exports of paper and paper products from Japan during 1934 were valued at 31,329,134 yen, an increase of 4,732,000 yen over the preceding year. Exports of paper and board were valued at 20,650,000 yen, the remainder representing shipments of various paper manufacturers. Paper exports from Japan consist largely of Japanese paper intended for Japanese firms abroad. Approximately 80 per cent of the total shipments go to Kwangtung, Manchuria, and China. (Office of Commercial Attache, Tokyo.)

◆ Bucher Elected Vice President of Westinghouse Electric & Manufacturing Co.

At a recent meeting of the Board of Directors of the Westinghouse Electric & Manufacturing Company George H. Bucher was elected a vice president of the company. Mr. Bucher will make his headquarters in New York.

Mr. Bucher, who is also President and General Manager of the Westinghouse Electric International Company, has been connected with the Westinghouse organization since September 1, 1909. After graduating from Pratt Institute, Brooklyn, in both steam and machine design, and also electrical engineering, Mr. Bucher joined the Westinghouse Electric & Manufacturing Company at East Pittsburgh as a graduate student. In 1911 he was transferred to the Export Department in New York and in 1920 he was appointed assistant to the General Manager of the Westinghouse Electrical International Company. In 1921 he was promoted to the position of Assistant General Manager. In 1932 he advanced to the position of Vice President and General Manager, and in 1934 he was elected President of the same company.

Mr. Bucher is a member of the American Institute of Electrical Engineers, and Engineers' Club of New York.



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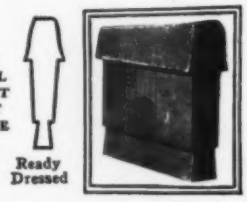

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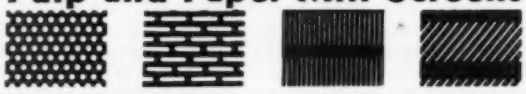

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333 North Michigan Avenue ·.· Chicago, Illinois

The Paper Industry Safety Contest

July 1, 1934 to June 30, 1935

Scores as of January 31, 1935 (Cum.)

18 Mills Maintain Perfect Record

PERFECT SCORES

Division I—Paper and Pulp Mills

	PARTICIPANT	MILL	LOCATION
GROUP A			
GROUP B	St. Croix Paper Co.	Woodland	Maine
GROUP C	Escanaba Paper Co.	Escanaba	Michigan
	Crystal Tissue Co.	Middletown	Ohio
GROUP D	Kimberly-Clark Corp.	Lakeview	Neenah, Wis.
	International Paper Co.	Webster	Orono, Maine
	Bird & Son, Inc.	Phillipsdale	Rhode Island
	U. S. Envelope Co.	Worcester	Massachusetts
	International Paper Co.	Livermore	Chisholm, Maine
	Spaulding Fibre Co., Inc.	New Mill Plant	Milton, N. H.
	International Paper Co.	Riley	Maine
	U. S. Gypsum Co.	Gypsum	Ohio
	Spaulding Fibre Co., Inc.	Hayes	North Rochester, N. H.
	Mead Paperboard Co.	Rockport	Indiana

Division II—Remanufacturing

Texas Corrugated Box Co.	Dallas	Texas
Container Corp. of America	Natick	Massachusetts
Southern Container Co.	Houston	Texas
U. S. Gypsum Co.	Genoa	Ohio
Bemis Bros. Bag Co.	East Pepperell	Massachusetts

IMPERFECT SCORES

	Key Number	Rank	Disabling Injuries	Frequency Rate
GROUP A	P-19	1	3	3.802
	P-108	2	7	5.316
	P-64	3	6	5.521
	P-18	4	8	6.477
	P-27	5	10	6.516
	P-13	6	8	7.707
	P-62	7	9	8.017
	P-30	8	8	9.295
	P-12	9	7	9.373
	P-67	10	14	11.218
	P-44	11	11	12.226
	P-31	12	13	13.175
	P-95	13	11	14.498
	P-114	14	15	14.982
	P- 1	15	19	15.889
	P-69	16	16	17.113
	P-102	17	22	18.717
	P- 2	18	16	20.587
	P-101	19	17	22.838
	P-28	20	62	25.120
	P-87	21	27	26.451
	P-78	22	22	27.962
	P-74	23	44	48.728
	P-71	24	52	68.448
GROUP B	P-33	2	3	4.335
	P-21	3	3	4.838
	P-68	4	3	5.466
	P-10	5	5	7.247
	P-70	6	4	7.368
	P-25	7	4	8.752
	P-40	8	6	9.700
	P-11	9	5	11.078
	P-112	10	6	11.099
	P-22	11	9	17.658
	P-60	12	10	18.111
	P-46	13	8	18.927
	P-45	14	12	19.020
	P-16	15	12	24.995
	P-26	16	15	27.196
	P-104	17	12	28.317
	P-76	18	13	28.763
	P-82	19	16	29.027
	P-77	20	13	30.225
	P-32	21	17	31.114
	P-73	22	22	33.328
GROUP C	P-72	3	1	2.615
	P-100	4	1	3.218
	P- 3	5	3	7.627
	P-56	6	4	9.644
	P-89	7	3	15.684
	P-43	8	4	15.840
	P-88	9	4	16.447
	P-61	10	5	16.966
	P-41	11	5	18.645
	P-51	12	8	20.026
	P-17	13	5	21.594
	P-59	14	8	22.140
	P-75	15	6	23.075
	P- 4	16	6	23.109
	P-33	17	7	24.927
	P-48	18	8	25.101
	P-79	19	9	26.441
	P-29	20	8	29.977
	P-14	21	7	32.474
	P-49	22	8	32.648
	P-113	23	12	50.778
	P-47	24	21	70.182
	P-50	25	22	101.621
GROUP D	P-103	11	1	5.236
	P-94	12	1	6.130
	P-100	13	1	7.329
	P- 6	14	2	10.210
	P-110	15	1	15.911
	P-107	16	3	18.389
	P-42	17	2	19.870
	P-83	18	4	22.431
	P- 7	19	4	24.230
	P- 5	20	5	24.647
	P-93	21	2	25.658
	P-99	22	2	26.009
	P-24	23	4	33.423
	P-80	24	7	36.882
	P-81	25	9	48.668
	P- 8	26	5	50.327
	P-98	27	10	80.645

DIVISION II

R- 6	6	4	7.305
R- 5	7	4	7.593
R- 2	8	3	8.213
R-10	9	3	8.459
R- 3	10	1	9.294
R-16	11	2	9.904
R- 9	12	4	22.021
R- 1	13	9	36.894
R-13	14	8	48.490

No January Report: P-83, P-88, P-89, P-114 and R-6.

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Their experience is available to you, any time. Our job is to help paper and pulp mills. Murray equipment is used by mills in all parts of the country—all machines accurately engineered to meet customers' requirements, for maximum efficiency at lowest production cost. Write for descriptive folder on any particular machine or the complete Murray line—or tell us your problem.

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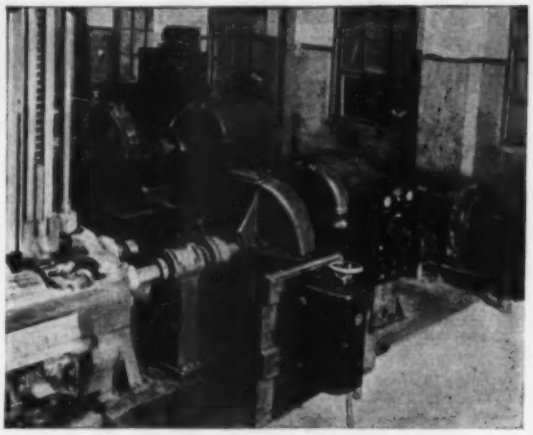

G-E variable-voltage winder drive, with regenerative-braking tension control, in a modern paper mill

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G-E VARIABLE-VOLTAGE WINDER DRIVES

YOUR operators will find it easy to produce rolls of uniform tightness — the kind that gives your customers greater satisfaction and increases the sales features of your product — with G-E variable-voltage winder drives.

These drives provide automatic control of tension by regenerative braking throughout the winding process.

Regenerative braking also provides new economy of operation that will reduce your winding costs. This feature makes it possible to return power — formerly lost in mechanical braking — to the drive motor through a generator attached to the unwinding roll. This feature gives you a saving of from 10 to 60 per cent of the power input to the drive motor, with a corresponding saving in power costs.

Get the money-saving, sales-building advantages of this drive for your mill. Investigate today. Address the nearest G-E office, or Dept. 6B-201, General Electric, Schenectady, New York.

020-141

GENERAL ELECTRIC

Uncle Jake Goes Back 50 Years

. . . back to the days of

"Nosey" Hill	McGinnis
"Bill" Wentz	Seymour
"Bob" Butler	Flannery

. . . and a score of others like them. Here today, gone tomorrow, drunk on Saturday night . . . tramp papermakers. What a roistering, hard-bitten, hell-for-leather lot they were.

Those were the days when every real papermaker took professional pride in measuring up to these specifications:

He must

(1) Cuss like a drunken sailor.
(2) Chew natural leaf tobacco.
(3) Drink rot-gut whiskey.
(4) Wear a greasy shirt.
(5) Be equally accurate with either foot on a back tender's posterior.
(6) Blame everything that went wrong on either the beater engineer, the millwright, or the back tender.

Well, these old timers not only lived the rules —they wrote them! Remember the stories of their incredible prowess—of the dozens of run-down mills they had put on their feet—of the general managerships they had turned down because the life was too soft—what heroes they were to us young back tenders! Why, we'd rather have been "Nosey" Hill in those days than President!

But they knew paper. And with a wire or a string here and a stick there, they had the crankiest paper machines in the world talking baby talk.

Most of them are gone now . . . gone the way of the tramp printer . . . and golly . . . somehow we miss 'em!

UNCLE JAKE.

●

KALAMAZOO
VEGETABLE PARCHMENT COMPANY
PARCHMENT MICHIGAN
(Kalamazoo County)

POWER

GENERATION + UTILIZATION + MAINTENANCE

This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worth while practices suggest new ideas and wider usages of equipment.

By W. S. JOULE

◆ Brush Reliability

Brushes constitute one of the most important details of motor equipment affecting the reliability of operation, and hence must be selected with considerable care if the highest continuity of service is expected. In order to give intelligent consideration to the selection of brushes, the user should be conversant with their essential characteristics and should have a thorough understanding of the best methods of determining their strength, hardness, density, specific resistance, contact drop, coefficient of friction and thermal conductivity.

◆ Efficiency in Small Plants

These are days when the high cost of fuel brings the question of efficiency very much to the front. Big plants where the total losses run into large figures have on the whole been fairly well taken care of, but in small plants rather shocking conditions are to be found. The efficient operation of small plants, especially with reference to boiler and furnace conditions, which are commonly much less good than in the large stations should be given careful study. It also is true that prime-mover efficiencies are very frequently extremely bad where the output is not large both on account of the accompanying poor load factor and because small units have received relatively little attention in this country.

With respect to boilers much of the trouble comes from dirt and scale. The deposition of these on the heating surfaces is fatal both to the efficiency of steam production and to the output of the plant, for combustion is very seriously impeded where the space which should be free for hot gases is taken up by debris.

A word of warning is given as to boiler compounds. Nearly all of them are effective on some particular waters, but a perfectly good compound for dealing with one quality of water may be almost useless on another and in fact may precipitate priming. Before deciding on preventive means, it is necessary to test the water and see to it that the scale-preventing compound used is such as will actually do the work without creating difficulties.

Outside the boiler proper, the furnace needs looking after, first to insure suitable combustion and second to avoid loss of heat through leakage in the settings. Leaks in the settings of the flues and side walls can generally be observed. If these exist in the baffle system, detection is more difficult, but they may frequently be run down by a process of elimination when there is a notable departure from standard operating conditions. It must not be forgotten that not only does neglect damage the performance of boilers but it may actually seriously reduce their factor of safety through corrosion of the flues and the overheating of the metal due to scale deposits.

If first-class boiler efficiency is to be reached, the performance must be closely watched. It is highly desirable to weigh the coal and to have both water and steam meters, so that the final output as well as the intermediate steps may be closely watched. The cause of any failure in suitable performance then needs to be run down, and for this purpose the temperature and proportion of CO_2 in the flue gases should be watched instrumentally, along with close inspection of the actual working of the fires.

The whole secret of success in operating a small steam plant is to exercise the same care that would be applied to a big one, for while the total amount involved is not so large in the former case, the relative gains possible are likely to be greater, and beyond the boilers every effort should be made to install engines of the best efficiency or to follow up those which are in place with the indicator and see to it that within their limitations they are doing the best of which they are capable.

◆ TO PRESERVE wire rope, apply raw linseed oil with a piece of sheepskin, wool inside; or mix the oil with equal parts of Spanish brown and lampblack. To preserve wire rope under ground or in water, take mineral or vegetable tar, add 1 bu. of fresh slaked lime to 1 bbl. of tar, which will neutralize the acid; boil it well, then saturate the rope with the boiling tar.

◆ Do You Carry Job Insurance?

If you are wise you are carrying job insurance. It doesn't go by that name and you may say that there "ain't no such animal," but there is.

When you buy your engineering books, pay your dues for professional societies or renew your subscriptions for the technical and industrial papers you are taking, you are paying your premiums on job insurance. It may not be quite so definite an arrangement as fire or life insurance but the idea is the same.

All of the agencies you make use of to increase your own knowledge, to make yourself more valuable to your employer and a greater credit to your trade or profession, increase the probability that your income will not only continue, but will increase with passing years. It is true that you may be out for a time but the insurance works and back you come, to another and possibly better job.

Every professional man owes it to himself and to the profession which he represents, to set aside a definite portion of his income for his own professional advancement. This statement is not our own but is a recollection of one made by Theodore Roosevelt. It is good advice and might be summed up with the question: Do you carry job insurance?

◆ TO PREVENT INTERNAL corrosion in idle boilers these should be emptied and dried, trays of unslaked lime should be placed inside, and all manholes and other openings should be hermetically sealed. The lime will soon absorb any moisture, carbonic or sulphurous acid that may be in the boiler, and any remaining salt or chloride of magnesia, being dry, can do no harm.

◆ Economies in Storeroom Stocks

It is an odd fact that in the handling of the cash drawer the utmost precautions are taken by most companies to prevent losses; while in the handling of supply stocks, which are essentially cash, cases of the utmost carelessness are constantly observed. The storeroom is frequently a serious offender, the offense consisting of careless methods of handling and accounting and the purchasing and carrying in stock of unnecessary items.

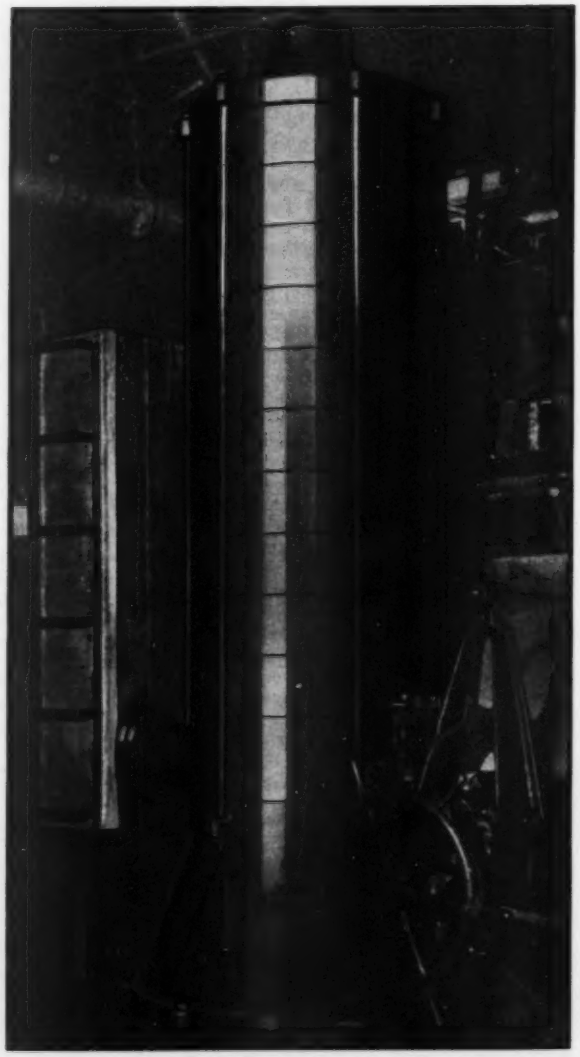
One of the easiest methods of reducing storeroom stocks and therefore reducing the cost of storeroom service and releasing capital for other necessary uses lies in a careful study of the ways and means of using material in construction work. Not only is investment cut down but the handling of material is simplified because there are fewer items and the simplifications lead to lower costs of handling.

◆ Broken Down Oil

Even the best of hydrocarbon oils have a limited life when used in the circulating systems of the present day installations. After having been filtered and re-filtered, used and re-used, even the highest grade of oil will eventually become worn out, lose its lubricating value and have to be discarded.

What About Maintenance Costs?

A GENTLEMAN recently told us that he understood the maintenance or upkeep costs on the FRITZ REFINING AND HYDRATING MACHINE were very high. Of course he did not say who told him. We showed him two reports, one from the superintendent of a mill in New York state in which he wrote, "Mr.————of————company was at our mill last week and I was just moving one of our Fritz machines and was able to show him that although we had run this machine for three years he could easily see the grinding wheel marks on the face of the bars on the rotors, indicating that there had been no perceptible wear on these bars." ○ The other report was from the engineer of a mill in Michigan where the machine had been used more than three years. This report said, "We have not had any upkeep expense. One of the bearings was replaced, having been redesigned, and the new type of bearing was put in the machine, but up to date there has been no expense for replacements or upkeep." ○ Sooner or later parts of this machine will wear out, as all machines do, but this will be many years after the date of purchase. ○ There are few machines in any paper mill that will stand the gaff that the FRITZ REFINING AND HYDRATING MACHINE will stand. Most of the machines now running have never had a cent spent on them for repairs or upkeep. ○ Let us tell you more about this remarkable machine.



LOVE BROTHERS, INCORPORATED, AURORA, ILLINOIS

TECHNICAL DEVELOPMENTS

IN THE PAPER INDUSTRY

The following abstracts are of the latest developments found in the foreign press and in the patent offices. Photostats and translations of complete articles and patents can be obtained at cost price.

◆ Absorption of Liquids by Pulps

The capillarity of pulp which is measured by the height of a liquid rising in a pulp strip during a definite time interval is significant when the material is to be used in parchmentized paper, viscose manufacture, or in plastics. Up to the present the only liquid that has been used was water, but the authors have now made an intensive study in which hydrophylic and hydrophobic liquids, dye solutions, salt, alkaline and acid solutions were used. It was shown that the rise or absorption of a liquid is a function of its viscosity, provided salts or alkalies are not present. The use of special wetting agents in small amounts, where the viscosity of the solution remained practically unaltered were without appreciable effect. However, as their concentrations and viscosities increased, the capillary rise lessened. This was also shown in the case of various polyhydric alcohols in aqueous solution. As an example:—whereas pure water rose to a height of 122 mm. in 1 hour on a certain bleached sulphite pulp, 50 per cent glycerol (having a viscosity of 4.3 times that of water in an Ost viscosimeter) rose 60 mm. during the same period, and 100 per cent glycerol, (viscosity 616) rose only 12 mm. The hydrophobic oils:—linseed, rapeseed or castor oil (all of which have viscosities more than 350 times that of water) showed markedly lower absorption than water. On the other hand, such compounds as orthodichlorobenzene (the viscosity of which

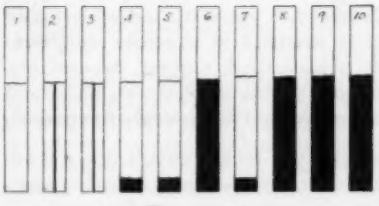


Figure 1

is almost identical with that of water) shows the same capillary rise as does water, while paracymene, and anisole are even more readily absorbed. However, turpentine, diethylphthalate, ethylbenzylaniline, and paraffin oil are all markedly lower. In each case the relative absorption by pulp is directly correlated with the relative viscosities. Since it is difficult to measure accurately the rise in pulp strips of colorless liquids, various water-soluble and oil-soluble dyes were used as indicators. A few of these results are shown schematically (to scale) in Figure 1. Here the relative capillary rises are shown, (1) for water, (2) for water in the case where a vertical indicator line was made initially with indelible pencil on the pulp strip, (3) 1 per cent antipyrene in water, using a vertical indicator line of ferric chloride which turns red as the liquid rises, (4) bichromate in water, (5) crystal violet hydrochloride in water, (6) crystal violet (free base) in dimethyl aniline, (7) Rhodamine B hydrochloride in water, (8) Rhodamine B (free base) in orthodichlorobenzene, (9) quinophthalone in paracymene, (10) Sudan III in monochlorobenzene. In the last 7 diagrams of Fig. 1 the black portion indicates the actual relative rise of the dye solution or of the colored salt. Obviously nothing is gained by using salts in making the tests. The solutes are separated at the bottom of the strip, and only the rise in water is measured. This holds true also for NaOH. In all these cases the pulp serves to a certain extent in separating solute and solvent. However, in contrast to alkalies and salts, acids are not locally adsorbed, and the capillary rise of various acids and acid solutions is again definitely correlated with the viscosity. The absorption appears to be independent of the constitution of the acid used. Pulp samples containing from 0.4 per cent to 21 per cent moisture show practically no absorptive differences. Bone-dry pulp gives anomolous results, and all tests are best carried out with air-dried material. Absorption decreases regularly with increased degree of beating. Parchmentized, and well-sized and loaded papers are no longer absorbent. However, the test is of great value in judging blottings, and also as a measure of the degree of beating, giving a means of finding the point at which parchmentization sets in. Thus these quantitative absorption tests may be co-related with the blister test [Cf. THE PAPER INDUSTRY 16, No. 7, 513 (October, 1934)]. The technique for carrying out the absorption tests has been standardized. Pulp strips, 15 mm. wide, and of suitable length are cut from the so-called Scleicher and Schüll Tupfreaction Carton No. 601. (This is pulp usually used for making chemical spot tests). The temperature of the liquid is maintained at 20 deg. C. The equipment is shown in Figure 2. Here (2) is a movable bar provided with slits for holding the pulp strips, and with screws; (3) represents the pulp strips; (4) is the liquid; (5) which may be raised or lowered is the bath for (4); and (6) is a low movable stand, for supporting the equipment, which during the course of the test is completely covered by the glass case (1). The latter is essential since it prevents evaporation of the absorbed liquids. At the outset of the test, (1) is removed. The strips (4) are fastened into (2), after a horizontal pencil mark has been made 5 mm. above the lower end of the strip. The bath containing the liquid (at 20 deg. C.) is then raised until the surface of the liquid just reaches the pencil mark (i. e. the zero points) on each strip. This is then clamped into place and the entire device covered with (1). The capillary rise is measured at the end of 10 minutes and at the end of an hour

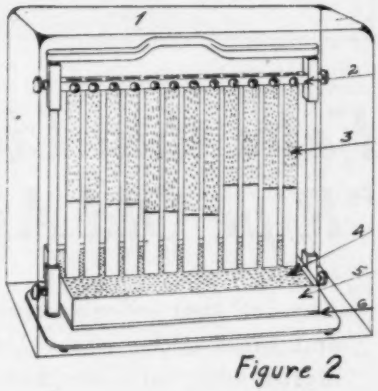
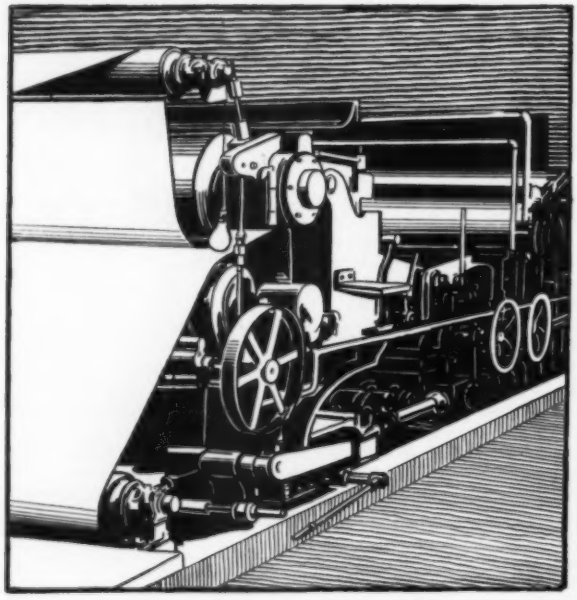


Figure 2

(using a stop watch). Since marks must be made showing the height of liquid on the strips at the end of 10 minutes, (1) is lifted just long enough to accomplish this, and is then replaced. At the end of the hour, the height of the liquid is again marked, and the strips are laid flat and the distances between the zero point and the marks are accurately measured. The average of 5 determinations should be used. These quantitative height measurements may serve a purpose besides showing the absorptive properties of the pulp. They furnish a rapid means of analyzing liquid mixtures containing two components. Curves in which the per cent composition of the mixture is plotted against the capillary rise are drawn, and if the same pulp is used throughout, and the conditions are kept constant, the test furnishes a practical means of analysis. An excellent table shows the relative viscosities at 20 deg. C (Water equals 1) of over 200 liquids, pure and technical. The measurements were made in an Ost (and less frequently in an Engler) viscosimeter. This list, which cannot be reproduced here because of its length, includes esters, ketones, hydro-carbons, alcohols, nitrogenous bases, aldehydes, the principal components of certain essential oils, phenols, certain fixed oils, halogen derivatives as well as a number of



Felts that Live to a "Ripe Old Age" . . .

Any felt that will remove water faster and outlast the general run of felts merits your consideration. If you can reduce your felt cost you can add to your profits. A dollar saved is a dollar earned . . . and in the course of the year's production Orr Felts will save many dollars.

Highly specialized manufacturing skill, years of experience, knowledge of mill problems and a real desire to lead the field have given Orr Felts a quality and degree of excellence that stand back of their claim to superiority.

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With PRINTED Weight Records

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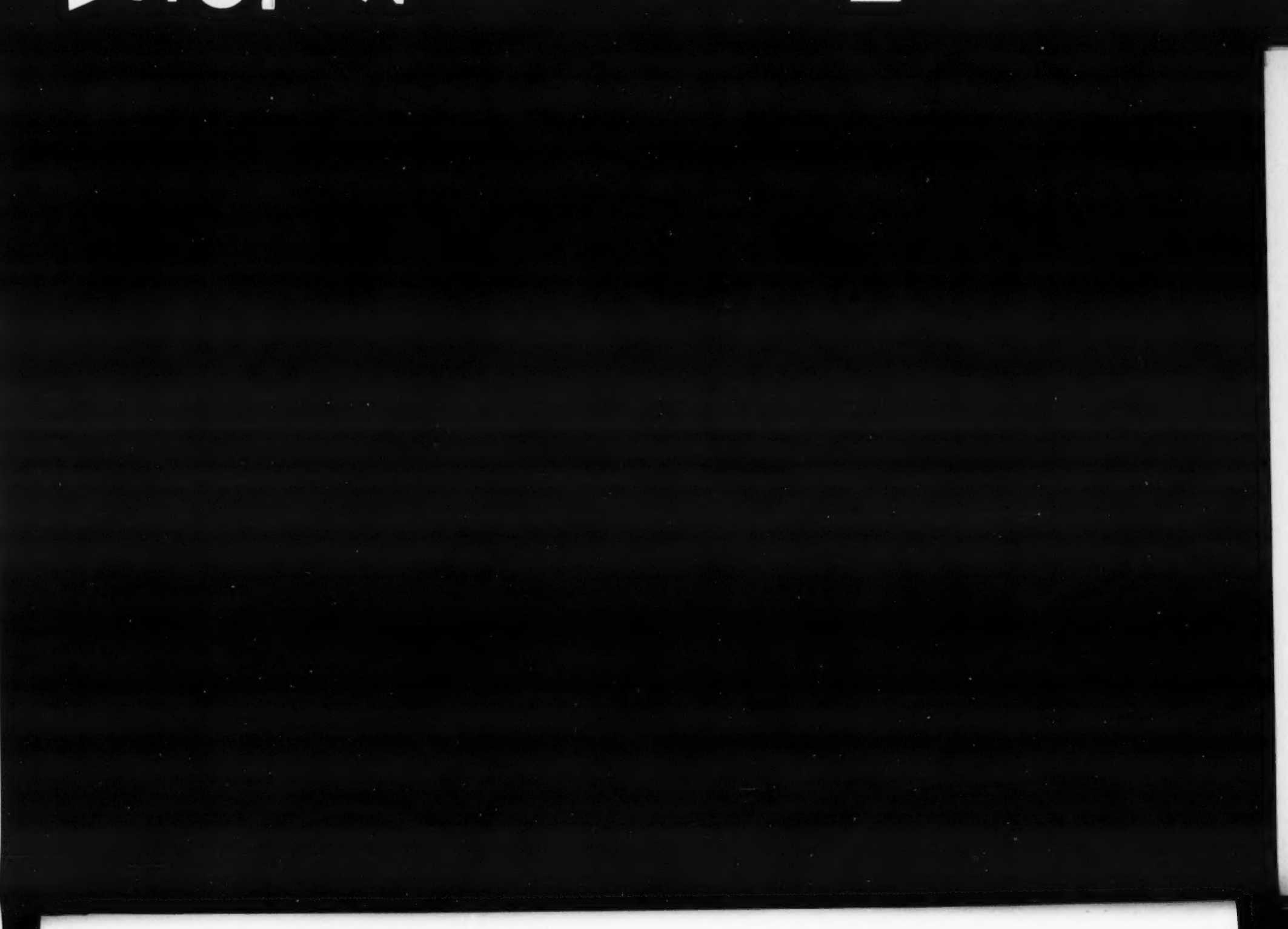
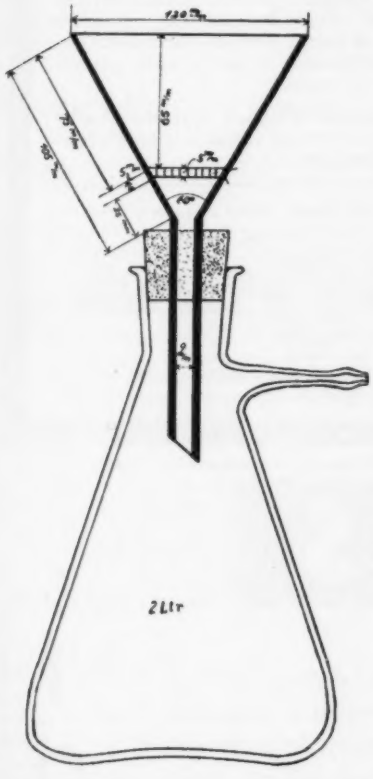
181 SALES AND SERVICE OFFICES THROUGHOUT U. S. AND CANADA



commercial products. This table, together with numerous others, as well as a number of graphs clarify the text. August Noll and Fritz Bolz, Papier-Fabr. (Tech. Section) 32, No. 46, 465-70; No. 47 473-477 (1934).

◆ Standardizing Alpha Cellulose Determination

This (7th) memorandum of the German fiber commission (Cf. the preceding abstract) uses a very carefully standardized technique based on the Jentgen method. The standard alpha-funnel, the exact set-up of which is shown and which is drawn to scale in the illustra-



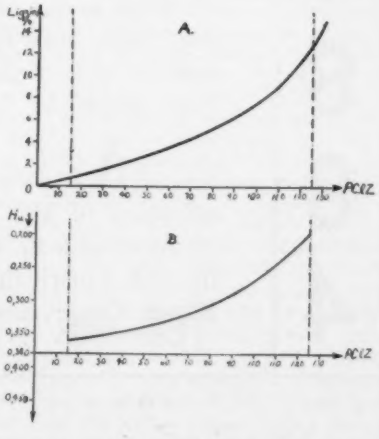
tion, contains a porcelain filter-plate, the upper diameter of which is 40 mm. and the lower diameter is 35 mm. This plate contains 60 perforations, each one mm. in diameter. The cellulose sample 3.5 grams, in the form of flecks obtained by use of the standard rasp, and containing 6 to 8 per cent moisture, is treated with 17.5 per cent (by weight) NaOH in a Duran glass beaker. This solution must be at 20 deg. C. when it makes contact with the pulp, which is carefully wet down with the caustic soda by means of a glass red, during one minute. Kneading and vigorous stirring must be strictly avoided. The beaker is then covered with a watch-glass and kept at 20 deg. for 45 minutes. Thereupon the mass is poured on the alpha funnel, under very mild suction. The filtrate is immediately poured back into the funnel to assure the recovery of the few fibers that may have been swept through. A glass rod, flattened into a miniature pestle, serves to flatten the alpha cellulose around the edges of the cake. Only slight pressure should be applied. Directly following this, 400 cc. of 8 per cent (by weight) of NaOH at 20 deg. C., are poured over the cellulose cake, and the suction is so maintained that the residue on the filter is always covered with liquid, and that exactly 5 minutes are required for the filtrate to collect in the 2 liter suction flask. The time element is of the highest importance. Thereupon the cellulose cake is rinsed with 2 successive portions of water of 10 cc. each. The filtrate is then carefully transferred to a 500 cc. volumetric flask and the suction flask is rinsed with 10-20 cc. of water. The volumetric flask is then filled to the mark. Its contents are used in the determination of alkali-soluble matter, of beta, and of gamma cellulose. The suction flask is replaced as in the illustration, and the alpha cellulose washed with 1½ liters of distilled water, followed by 100 cc. of 10 per cent (by volume) acetic acid. In the latter case 3 minutes are allowed to elapse during the rinsing period. Then the cellulose cake is washed to neutrality with 2 liters of distilled water, care being taken to keep the material covered during all rinsings and to avoid the formation of small channels at the edge of the circular cake by the judicious use of the glass pestle. Finally the cellulose is sucked dry sharply, carefully pressed out, and then covered with 25 cc. of alcohol, a part of which is sucked off gently, while the rest is left in contact with the alpha cellulose for 5 minutes. The residue is then dried at 100-103 deg. C. tc constant weight, the weighing bottle being cooled in a desiccator over calcium chloride. The weight is calculated to the dry basis. The method gives results that are reproducible to plus or minus 0.2 per cent, and is admittedly arbitrary. It is for this reason that the commission explains all operations so minutely, and emphasizes temperatures, volumes, and time factors. It also gives very adequate descriptions for determining the total alkali-soluble matter, the beta cellulose and the gamma cellulose in pulp. Anonymous. Papier-Fabr. 32, 51-2, 521-523 (1934).

◆ Swelling of Spruce Wood in Various Liquids

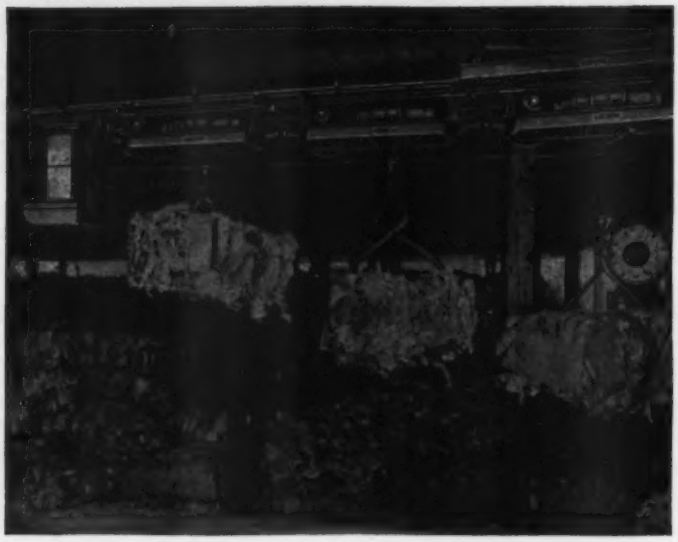
An important contribution to the so-called fine structure (i.e., the micellar arrangements) in spruce. Small, carefully dried, tablets of this wood (10x10x1.5 millimeters) were thoroughly saturated with such liquids as benzol, ether, pyridine, methanol, acetone and water. The changes in the dimensions of these platelets were carefully determined, as were those obtained on drying, after saturation had taken place, and also after the pretreated samples had been allowed to swell in water vapor. The data and graphs are given in detail. Wood and lignin (isolated by Freudenberg's method) both swell in all the above media. In the case of lignin, acetone causes the greatest volume change, pyridine comes next, and water is the last on the list. Thus lignin is an organophylic substance. If we exclude pyridine, which seems to have a very specific action on wood, due to its basicity, the function of these liquids as swelling agents is correlated with their chemical constitution. Swelling decreases as the hydrocarbon structure of benzol is approached, and increases as the constitution of water is reached. It appears then that cellulose, which is hydrophylic, plays a part and that the swelling induced by water would follow from the spiral arrangements of cellulose micelles in the wood. However, anisotropic swelling also occurs when benzol is used as medium. Lignin appears to be responsible for the action of organic liquids, especially acetone. Even on drying, the sample wood tablets retain small amounts of the liquids with which they were saturated, and these are replaced by water, when the tablets are treated with water vapor. After the final drying the volume of the wood platelet is always smaller than prior to saturation with the solvent. Decreased swelling of the wood on ageing is due to an irreversible compression of the wood structure, resulting from intracellular strains and slippages. The authors discuss at some length the theoretical implications resulting from their experimental data. Hj. Saechtling and H. Zocher. Kolloid-Beihefte 40, Nos. 7-12, 413-448 (1934).

◆ Optical Studies on Pulps

Under this same title, the first two papers were abstracted in THE PAPER INDUSTRY 16, No. 10, 715 (Jan. 1935). These dealt with the influence of (1) beating, and (2) loading on the optical properties of the sheet. For details, including a sketch of one of the instruments used, the reader is referred to this abstract. The present study deals with the effect of the degree of pulping (delignification) on the optical properties. The results, which are given in



very detailed tabulated form, may be summarized as follows: The permanganate-chlorine number (termed PClZ) as revised by Küng (Cf. Papier-Fabr. 1931 Fest-und Auslandsheft, No. 23A, 73-77) served to measure the degree of pulping of the sample used. With de-



Baled Waste Paper

AND ITS ECONOMICAL INTRA AND INTER PLANT TRANSPORTATION.

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CHECK up where you will, among our largest users and on down to the smallest, and you will find that Detroit's Products *Stay* Sold. And little wonder, for since those days way back in the eighties and continuing up to the present time, our efforts have been given to furnishing the highest uniform quality possible.

• • • •

ALONG with this, it is, as it always has been, the determination of this company to carry into constant practice in all of its dealings, those high principles which have been fostered by the American Paper and Pulp Association and the National Paper Trade Association since their inception many years ago.

"MAKERS OF PAPERS OF STRENGTH"

Detroit Sulphite Pulp & Paper Co.

DETROIT, MICH.

DETROIT'S PRODUCTS *STAY* SOLD

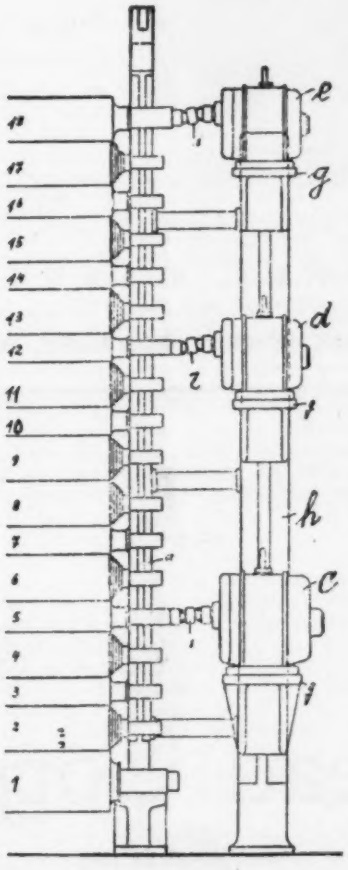
creasing lignin content, the brightness of the sheet (as previously defined) increases, assuming always the use of the same wood, and the same degree of beating prior to the photometric test. This relationship is clearly shown in the two accompanying graphs, Fig. (A) indicating the per cent lignin plotted against PClZ while Fig. (B) shows the brightness H_u also plotted against PClZ. Apparently there is a very insignificant increase in transparency with increasing delignification. Ultraviolet irradiation serves to show that there is an increase in violet fluorescence colors in the sheet as the degree of pulping increases. These latter changes may be observed qualitatively, but are not subject to quantitative measurement. Hans Ress. Papier-Fabr. 32, No. 42, 438-40; No. 43, 443-46; No. 44, 450-55 (1934).

◆ Standardization of Alcoholic Extraction of Pulp

The 6th memorandum of the Commission of fiber analysis of the German Association of Pulp and Paper Chemists and Engineers deals with the total rosin (by alcohol extraction), and its components: unsaponifiable matter, fatty acids, and rosin acids in pulp. While dichloromethane serves to extract the total free fats and acids, i.e., those not present as soaps, the alcohol extract gives higher yields of rosin and fatty acids since it also extracts the calcium and magnesium resinates. The closely standardized procedures uses 10 grams of air-dried, rasped flaked pulp, prepared according to memorandum 4 of the Association [Cf. THE PAPER INDUSTRY, 16, No. 9, 647 (Dec. 1934)], which are extracted in the apparatus, shown in the Commission's 5th memorandum [Cf. illustrations in THE PAPER INDUSTRY, 16, No. 7, 514 (Oct. 1934)], for 6 hours with 96 per cent alcohol. Moisture is determined on a separate sample. The extract is filtered, the filter rinsed with alcohol, the combined extracts concentrated on a steam bath and finally transferred to a weighed beaker and evaporated to a sirup. At this point the beaker and extractives are dried for 2 hours at 100 deg. C. in an oven. The error is plus or minus 0.05 per cent. If it is desirable to find the mineral content of such an extract, 50 grams of the original pulp should be extracted, and the dried extractives ashed at red heat. The ash is calculated to CaO, and may be used in approximating the percentage of combined resin and fatty acids in the soap, by arbitrarily assuming a mean molecular weight of approximately 319 for the calcium soaps. If the original extractives are to be further fractionated, 1 to 2 kilos of pulp are extracted with alcohol and Marcusson's method (Cf. Die Untersuchung der Oele und Fette, 3rd. ed., 1927, p. 72) is used in determining unsaponifiable material. The separation of the resin and fatty acids is carried out by the procedure suggested by Wolff-Scholze (Cf. Chemiker-Ztg. 1914, 369, 382, and 430). This depends on the fact that fatty acids are converted into methyl esters by means of methanol and sulphuric acid while the rosin acids (due to steric hindrance) remain practically unesterified and may be titrated with cold 0.5 N alcoholic potassium hydroxide. For full details of all these special methods the original memorandum should be consulted. Anonymous. Papier-Fabr (Technical Part) 32, No. 48, 481-2 (1934).

◆ Electrical Drives for Calender Rolls

The object is to utilize a small number of electrical motors to drive individual rolls in the stack. These driving motors (c), (d) and (e) are supported on brackets (g) attached to a special framework (h). These brackets (g) may be raised or lowered as desired, and again securely fixed into place in suitable positions



on (h). The motor shafts are connected with the journals of the rolls by means of articular couplings (i). As a result of such flexible arrangements, a motor may be coupled at will with any desired calender roll, thus making it possible to change the degree of friction within the calender stack, and to further regulate this by the number of motors kept in operation. J. Kleinewefers Söhone. Krefeld. German Patent No. 602889.

◆ The Groedel Method of Harvesting Wood

The tree is felled at some time between the summer and winter seasons, after having its bark and bast removed in a girdle about 10 cm. wide, at the point at which the future cutting is to take place. At the end of June the circulation of the sap is halted, and by the time of felling, the tree has lost about 50 per cent of its weight. The method combines the advantages of summer and winter cuttings. The resultant wood is neither red nor cracked. Girdling may be carried out without regard to season, and the logs, after cutting, may be shipped without storage. Although production is cheapened by the Groedel method more labor is actually required. E. Belani. Oesterr. Zentralbl. Papierindustrie, 52, 75-6 (1934); through the Papier-Fabr. (Auszüge), 32, No. 46, 76 (1934).

◆ Manchurian Pulps Used for Viscose

Two species of spruce, the so-called Gyorinsyso *(Picea ajanensis* Fisch.) (1), and Sansyo *(P. Schrenkiana,* Kupr.) (2) were studied. Two samples of (1) on alalysis showed alpha cellulose contents of 33.9 per cent and 36.9 per cent and lignin contents of 28.0 per cent and 30.4 per cent respectively. A single sample of (2) that was examined showed 32.1 per cent alpha cellulose and 30.0 per cent lignin. (Alcohol-benzene extractives, cold and hot water soluble matter, alkali soluble material, beta and gamma cellulose, pentosans, mannans, galactans, nitrogen, crude protein, ash and per cent methoxyl were determined in all cases). Various digestion experiments were made using magnesium bisulphite or mixtures of calcium and magnesium bisulphites (and in these the total SO_2 content was 6 per cent, the highest temperature of the cook 155 deg. C, and the duration of the cook was 8 hours). These were followed by mild bleaching and by treatment with 1 per cent NaOH at 135 deg. C. In several instances the pulp obtained from (1) was retreated with alkali, a technique, which after 4 hours resulted in a much lower alpha cellulose content. The best results were obtained from (1) by treatment with magnesium-calcium bisulphite, which yielded (per cu. meter of wood) 220 kg. pulp containing 87.6 per cent alpha cellulose and giving a finished viscose thread the strength of which was 1.56 grams per denier. A similar cook, carried out on another sample of (1) and followed by a separate alkali treatment for one hour, yielded 190 kg. pulp, containing 89.4 per cent alpha cellulose and giving a finished viscose thread with the strength of 1.32 grams per denier. These figures compare more than favorably with a Canadian Kipawa pulp which contained 88 per cent alpha cellulose and gave a viscose with a fiber strength of 1.2 grams per denier. Generally speaking, magnesium bisulphite cooks (without the presence of lime) were unsatisfactory. Masuzo Shikata Shokoku and Kazuhiko Akagi. Cellulose Ind. (Japan) 10, 21-23 (1934), through Papier-Fabr. (Auszüze) 32, No. 51,121, (1934).

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THE CORROSION RESISTANT ALLOY

is proof against corrosion by sulphite acids

MISCO "C" bottom elbow weighing 650 lbs. Replaced bronze casting weighing 1500 lbs.

Not only are MISCO "C" castings impervious to the action of sulphite liquor but they are also sound and readily machinable. For these reasons it is safe to specify MISCO "C" when ordering:

Digester Neck Rings **Digester Bottom Sleeves**

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Acid Valves **Acid Pumps**

Fittings **Bottom Elbows** **Strainers**

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The makers of MISCO "C" are cooperating with equipment manufacturers throughout the United States, many of whom have already adopted this alloy for all cast parts coming in contact with sulphite acids. Their use of MISCO "C" is your guarantee of corrosion free operation.

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The COMMERCIAL OUTLOOK

New York, March 1, 1935.

PRODUCTION activity in the paper industry during 1934 was approximately 25 per cent above the low level witnessed in 1932, it was brought out at the annual convention of the American Paper and Pulp Association in New York. This constitutes a considerable improvement, yet a further gain in activity has been recorded in recent weeks. A leading speaker at the convention stated that statistics for the first five weeks of the current year showed additional appreciable increase in paper business.

In the face of some uncertainties, sentiment within the paper industry is distinctly confident. Paper manufacturers and distributors are bullish on the outlook for this year. The feeling is that improvement in industry and trade is based on healthy, natural causes, and that a consistent uptrend will be seen as 1935 progresses.

Reports concerning the paper industry are encouraging. Some groups of mills are quite busy. There has been a decided expansion of demand for most classes of paper and board since the first of the year. Consumers and converters seem to be buying with greater confidence, and in larger volume. The steadiness of paper prices is having its effect; buyers evidently feel there is small likelihood of any downtrend in the market and consequently are acquiring supplies with comparative freedom, not alone for immediate use but also against forward requirements.

That the increased demand for paper is due primarily to broader needs of consumers and converters is generally agreed. Proof of this is had in the fact that buying customs have changed among purchasers of paper. There is some anticipation of requirements, and some stocking up, but by and large paper consumers and jobbers are permitting the future to take care of itself and are placing orders only when needs dictate. The improvement in business therefore is mainly due to an actual increase in requirements; in short, the great bulk of paper and board now being marketed by producing mills is moving almost directly into consumption.

Statistics covering general business continue favorable. Retail movement of merchandise the country over is fair, and promises to register further expansion as the Easter and Spring season draws nearer. Industrial output is rising, and the uptrend during the last several months has carried the index number up to the highest point seen since the inflation boom of 1933, according to the Federal Reserve Board. Industrial production was 90 per cent of the 1923-25 average in the Board's seasonally adjusted index on January 31, as compared with 86 at the end of December. This was the highest January index since 1930, when the index reached 106. Factory employment and payrolls showed gains during January, although a decline is usual in that month. Production of automobiles, steel and woolen and cotton goods led the upturn, the report stated, but construction continued to lag. Commodity prices are comparatively high, and in most instances exhibit firmness.

Conflicting advertising trends during January are indicated in Printers Ink index of newspaper and magazine lineage. Newspaper advertising was indexed at 73.5, based on the average lineage for 1928-32 inclusive as 100. This was a drop of 2.5 per cent from December but was 6.8 per cent over January last year. The magazine advertising index for January stood at 77.8, a rise of 6 per cent over December and 16.1 per cent over a year ago.

Production of newsprint in the United States and Canada amounted to 282,625 net tons in January, compared with 272,568 tons in January, 1934, and 319,321 tons in December last, according to the News Print Service Bureau. Canadian mills in January manufactured 201,959 tons, contrasted with 239,544 tons in December and 188,374 tons in January last year. United States mills produced 80,666 tons in January, against 79,777 tons in the preceding month and 84,194 tons in January a year ago. Shipments from mills in both countries ran considerably behind production. Mills in both countries shipped a total of 255,727 tons in January, compared with 341,020 tons in December and 272,148 tons in January last year. Shipments in December were far in excess of output, reflecting stocking up tendencies of customers in anticipation of a price rise. As a result of this, stocks at mills at the end of December were only 42,794 tons in both countries, or only 12½ per cent of the month's shipments. The substantial excess of production over shipments in January therefore restored stocks to a more normal figure at 69,209 tons.

Mills in the United States produced a total of 2,773,490 net tons of paperboard during the calendar year 1934, representing a decline from the 2,912,734 tons reduced in the preceding year, according to the report of the U. S. Census Bureau. Production last year was at 59.2 per cent of mills' rated capacity, compared with 63 per cent in the year before. Board mills operated an aggregate of 102,368,049 inch hours during 1934, against 105,986,270 inch hours in 1933.

December production of board amounted to 199,940 tons, showing a seasonal decrease from the 227,733 tons produced in the preceding month, but a gain over the 176,337 tons in December, 1933. New orders for board received by mills during December called for 201,121 tons, contrasted with 218,980 tons in the month before, while unfilled orders held by manufacturers at the end of December were for 65,723 tons, compared with 62,352 tons a month earlier. Shipments of board from mills in December aggregated 188,924 tons, against 211,019 tons in November last, and stocks on hand at mills at the close of 1934 amounted to 74,014 tons, compared with 75,865 tons a month before and 75,669 tons at the end of 1933. Total shipments from mills during the year 1934 reached 2,641,570 tons, falling below the year's production, yet exceeding the total shipments of 2,596,506 tons in 1933.

◆ ◆

◆ Largest Birthday Card

One of the interesting facts about the mammoth 150-foot birthday card which was presented to President Roosevelt was the extreme care which was exercised in selecting the paper for this unique greeting.

Because of the extraordinary length of the card, it was necessary to employ paper of exceptional strength. Next, the accordion-like format demanded a stock which would withstand repeated folding. Another requirement was that the paper be such as to harmonize with the impressiveness with which the entire project was designed and executed. Finally, the paper for this historical document had to be such as to retain all these qualities permanently.

Careful consideration of the above factors by Mr. Ernest Dudley Chase, who conceived the novel idea, led to the selection of Brown's Linen Ledger, the well-known product of the L. L. Brown Paper Company, Adams, Mass. Substance 36 was chosen. As the card was 22 inches in width, the paper weighed about eight pounds, and the cover boards about 22 pounds. Thus it probably was the most substantial greeting card on record—certainly the most voluminous one on record paper. The latter was furnished through the Storrs & Bement Company, Boston, and the card was by Rust Craft Publishers of that city.

◆ THE ROBERT GAIR COMPANY, INC., New York, N. Y., has added to its Canadian interests The Corrugated & Container Company, Ltd., Hamilton, and Concord Shipping Containers, Ltd., Toronto. Both companies have been active in the shipping containers field in Canada and have a combined capacity of about 7,500 tons a year. The business of both will be carried on with no change in management.

EDGAR Quality Clays

TWO OUTSTANDING ACHIEVEMENTS . . . The results of Fifty Years' experience in mining and preparing clays for the ceramic and paper industries.

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THE DRAPER FELT

Unexcelled for strength, openness, resiliency, and general running qualities. Made to meet the most exacting conditions on all types of machines and all kinds of papers. Only one grade and that the highest.

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Woolen Manufacturers Since 1856

REPRESENTATIVES

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PACIFIC SALES COMPANY, Security Bldg., Portland, Ore.

Domestic RAW MATERIALS

◆ Papermaking Rags

There's an adage in papermakers supplies circles to the effect that "the way roofing goes, so goes the rag market." Roofing rags at present are in an exceedingly strong market position, and have been for some time. Strength in such rags is founded not only on a fairly broad demand from roofing felt mills but also on a comparatively bullish supply condition. Prices have stiffened appreciably, and along with the uptrend in roofing grades, other old cotton rags tend higher decidedly.

Domestic roofing stock is selling at 1.30 to 1.35 cents per pound for No. 1 grade, and a cent to 1.05 cents a pound for No. 2 grade. At these price levels it is admitted to be none too easy to locate available supplies. Dealers put great stress on the sold up condition of the market, and the small quantities of roofing rags coming into view. On the other hand, felt mills are commencing to show more resistance to meeting higher prices. There has been a substantial advance in the market within the last several months; as an example, one of the leading New England roofing mills recently jumped its price $5 a ton in one overnight swoop. Dealers contend the increased demand from mills has cleaned up the market to such a degree that any further volume buying would result in additional advancement in prices.

One cardinal reason for the rise in roofing rags is the limited amount of such raw material received from abroad. Foreign markets are generally above a parity with price levels here, which has kept out supplies from the American market. Sales of foreign dark colored cottons to roofing felt mills have been recorded at 1.20 cents a pound ex dock New York for northern European rags and 1.05 cents for Spanish dark cottons, while foreign linsey garments have brought as high as 1.65 cents a pound ex dock. Importers assert no more supply is obtainable in Europe for sale to mills here on these price bases; that if roofing manufacturers desire more foreign rags they will have to grant higher values.

Old white and blue rags are strengthening in price. It is said considerable quantities of thirds and blues have been shipped to roofing mills, with the result a firmer technical position exists in these rags. Dealers usually ask at least 2.75 cents a pound f.o.b. shipping points for good packing of No. 1 repacked whites, with quotations ranging up to 3 cents, while repacked thirds and blues are quoted at 1.30 to 1.40 cents, and twos and blues at 1.50 cents or higher.

New cotton cuttings are selling in moderation although it is evident fine paper manufacturers are restricting their orders to required lots. No. 1 white shirt cuttings are reported bringing around 6.25 cents a pound delivered paper mills, in some instances a little higher and in others a bit less. Dealers ask 2.25 to 2.50 cents per pound for fancy shirt cuttings, 6.50 cents for unbleached muslins, 4.25 cents for light silesias, 3.75 cents for blue overall and cheviot cuttings, 5.75 cents for bleached canton flannels, and 1.75 cents for washables, these prices being f.o.b. shipping centers.

◆ Old Paper

The better grades of waste paper are in fair demand and holding to steady price levels; on the other hand, about the best that can be said regarding the bulky low grades, such as mixed paper and folded newspapers, is that they are in an ailing market condition. Consuming mills seem to be acquiring wanted supplies of these low grades at almost any prices within reason they care to offer, more particularly in the East. No. 1 mixed paper is selling out of New York at 15 cents per hundred pounds, and maybe at less, while folded news is bringing only about 25 cents a hundred. Packers complain bitterly of these low prices, yet an over-supply situation apparently is holding the market down.

Shavings are moving relatively well and at fairly attractive values. No. 1 hard white shavings are 2.10 to 2.25 cents a pound for the usual run of quality in the East f. o. b. shipping points, and No. 1 soft white shavings 1.70 to 1.85 cents, while No. 1 hard white envelope cuttings are selling freely on a price basis of 2.70 to 2.85 cents per pound. Old kraft paper is firm at 95 cents to $1 a hundred pounds for No. 1 packing, and ledgers are quoted at 1.10 cents a pound for all-white and 80 to 85 cents a hundred for colored. Books and magazines are rather slow moving and are around 50 cents per hundred pounds at shipping points in the East.

◆ Pulpwood

There appears to be some pressure from Canadian quarters to sell pulpwood and while the market shows little or no change quotably, the undertone is not firm. Consumers are buying in routine style but the market is far from active.

◆ Mechanical Pulp

Everything considered, demand for groundwood pulp is said to be fair. Buyers apparently are experiencing no trouble covering their wants, and are not rushing in to place orders, yet buying is of consistent character. Open-market trading in groundwood currently involves almost entirely Canadian or Scandinavian pulp; in short, very little domestic groundwood is selling to those consumers who purchase their requirements. Canadian groundwood of prime quality is $23 per short ton ex dock American Atlantic ports, or anywhere from $26 to $32 a ton delivered consuming mills, depending on the freight from seaboard. Such domestic groundwood as is moving in the open market is fetching about this same basis.

◆ Chemical Pulp

Production of wood pulp in the United States during the calendar year 1934 amounted to a grand total of 3,468,705 short tons air dry weight, according to figures compiled by the U. S. Pulp Producers' Association from reports from 163 identical pulp mills comprising approximately 88 per cent of all the pulp mills in this country, excluding soda pulp mills. Since a new basis of compilation was adopted at the outset of last year, the figures for 1934 are not comparable with pulp statistics for previous years. However, Census Bureau reports place the total pulp production in the United States in 1933 at 4,329,248 short tons, including soda pulp, while the 1932 output was 3,760,267 tons.

Of the total of 3,468,705 tons produced last year, 2,956,457 tons were used by producing companies, and 480,288 tons were shipped out. The shipments were divided 364,302 tons to the domestic market, and 115,986 tons for export from the U. S. Bleached sulphite production amounted to 774,894 tons; unbleached sulphite, 547,823 tons; unbleached sulphate, 924,042 tons; bleached sulphate, 87,474 tons, and groundwood, 1,122,610 tons.

The chemical pulp market exhibits fair activity of routine character, but consumers are purchasing reservedly. Prices show little change, established bases being maintained on sulphite, and kraft and soda pulp quotations ruling steady.

◆ Rope and Bagging

The feature in old bagging is the demand for roofing bagging, which has run prices of this grade up to 95 cents per hundred pounds f.o.b. shipping points. No. 1 scrap bagging is in fair call and dealers ask up around 1.35 cents a pound. Old rope is exceedingly quiet. Paper mills seem disinterested while apparently having their needs supplied. Prices are nominally 1.90 to 2 cents a pound for No. 1 old manila, domestic or foreign.

◆ Chemicals

Papermaking chemical quotations exhibit steadiness, with few changes of much note reported. Most of the movement is against contracts but there is some spotty current buying. Casein is quoted at 11 to 11.50 cents a pound for domestic, and 13.50 to 14 cents for the imported product, duty paid. Soda ash is 1.25 to 1.40 cents a pound f.o.b. works for bag shipments in carloads, while caustic soda is 2.60 cents for the solid product. Bleaching powder remains on a quotable range of 1.90 to 2 cents a pound at works.

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Import and Export MARKETS

IMPORTS

◆ Wood Pulp

United States imports of wood pulp during the calendar year 1934 showed some recession from the record-breaking total tonnage imported in the preceding year, yet registered a rise in aggregate value over 1933. Despite the decrease in the total tonnage imported last year from the year before, the 1934 importations of all kinds of pulp—mechanical and chemical—were the fourth largest in any previous twelvemonth, being exceeded only by the total receipts during the years 1933, 1930 and 1929. Imports of chemical pulp last year were the second largest on record, topped only by the 1933 total of such pulp.

According to figures compiled from official U. S. Department of Commerce reports, imports of chemical and mechanical pulp into the United States in 1934 reached a total of 1,612,615 long tons, valued at $61,850,269. This compared with 1,733,744 long tons of both chemical and mechanical pulp imported in 1933, of a declared value of $57,399,010, representing a decline of 161,129 tons, or 9.08 per cent, last year contrasted with 1933, but a gain of $4,451,259 or 7.75 per cent in total value during 1934 over the preceding year. The value of last year's imports was the highest since 1930, when the value aggregated $81,286,794.

Chemical pulp imports last year amounted to a total of 1,443,531 long tons, valued at $58,605,219, showing a decrease of 102,463 tons or 6.62 per cent in quantity contrasted with 1,545,994 tons imported in 1933, but a rise in value of $4,421,128 or 8.15 per cent over the 1933 imports. Last year's chemical pulp importations compared also with 1,154,907 long tons of a value of $43,652,916 in 1932; 1,237,600 tons of a value of $56,409,638 in 1931; 1,369,327 tons of a value of $74,140,504 in 1930, and 1,441,110 tons of a value of $82,840,220 in 1929.

Mechanical pulp imports during the last calendar year totaled 169,084 long tons, valued at $3,245,050, a decrease of 18,666 tons or 9.94 per cent in quantity compared with 187,750 long tons of a declared value of $3,214,919 imported in the year before. Thus, mechanical pulp imports registered a slightly greater percentage decline last year from the preceding year than chemical pulp. Moreover, the 1934 receipts of groundwood were but a shade in excess of the 1932 imports, and with the exception of that single year were the smallest total imports of such pulp in the last thirteen years.

Imports of bleached sulphite last year amounted to 355,484 long tons of a declared value of $19,415,304, compared with 400,633 tons of a value of $19,138,468 in the preceding year. Imports of unbleached sulphite reached 603,117 long tons of a value of $21,791,584 last year, against 643,003 tons of a value of $19,946,124 in 1933, while imports of unbleached sulphate or kraft pulp were 429,853 long tons of a value of $13,733,776 last year, contrasted with 461,980 tons of a value of $12,568,367 in the year before. Imports of bleached sulphate increased from 36,622 long tons of a value of $2,361,882 in 1933 to 48,275 tons of a declared value of $3,334,713 in 1934.

The average value of bleached sulphite imported during 1934 was $54.61 per long ton, against $47.77 in the year before; of unbleached sulphite, $36.12 per long ton, against $31.02; of unbleached kraft, $31.94, against $27.20, and of groundwood, $19.19, compared with $17.12 in 1933.

Pulp imports into the United States from Sweden during last year amounted to 706,076 long tons of chemical, valued at $24,311,435, and 15,812 long tons of mechanical, valued at $343,523. Imports from Canada were 482,923 long tons of all grades, valued at $20,198,321; from Finland, 184,975 long tons of chemical of a value of $6,522,620, and 8,126 tons of mechanical of a value of $211,885; from Norway, 83,370 long tons of chemical of a value of $4,047,231, and 4,703 tons of mechanical of a value of $83,479, and from Germany, 81,991 long tons of all grades of a declared value of $3,264,548.

The market for imported wood pulp is showing increased activity. Paper manufacturers in recent weeks have resumed buying on something approaching a normal scale, following the lull in demand over the holiday period and the early weeks of the year. The price tone is firm. In fact, it is believed revived confidence in the stability of prices, founded largely on the announced intention of pulp producers in Europe and in the United States to sustain established minimum market levels, is a cardinal cause of the return of consuming buyers into the market.

Prime bleached sulphite is quoted at 2.75 cents per pound to slightly higher, depending on grade, ex dock American Atlantic seaboard, while prime strong unbleached sulphite is 2.10 to 2.20 cents ex dock. A minimum price basis of 1.70 cents has been established on prime Scandinavian kraft pulp, ex dock Atlantic seaboard. Scandinavian groundwood is $22 or a shade less per short ton for dry pulp on the dock Atlantic seaboard.

EXPORTS

Exports of paper and paper products from the United States during the year 1934 exceeded in value those of the preceding twelvemonth by approximately 30 per cent, and, in volume of shipments, closely approached the high level of 1929, according to statistics compiled by the U. S. Department of Commerce. In a few lines, such as newsprint, greaseproof and waterproof papers, overissue newspapers and paper bags, the 1934 shipments exceeded those of the preceding year. Average export prices on the whole did not show much change compared with 1933, but were far below the 1929 level, a fact which accounts largely for the decrease of 50 per cent in the total value of the 1934 shipments as compared with 1929, while the volume of exports decreased only 13 per cent.

Nearly all classes of paper and board contributed to the rise in 1934 exports as contrasted with the year before. Exceptions were uncoated book papers, and envelopes. The smallest increases were noted in the board group, including insulating and wall boards. Bristols and bristol boards, which belong in the fine paper group rather than the board classification, increased 47 per cent, while writing paper shipments were greater by 37 per cent.

Total exports of paper and paper products last year were valued at $18,877,850, compared with $14,599,007 in 1933. Items which closely approached or exceeded $1,000,000 in value last year were: Newsprint and book papers, writings, boxboards, insulating boards and bat, greaseproof and waterproof paper, and vulcanized fibre. Exports of old and overissue newspapers were valued at $1,581,370, and exports of wrappings closely approached $2,000,000.

Exports of paper base stocks from the United States have been of increasing importance in recent years. Shipments during 1934 reached a total value of $8,149,576, which more than doubled the total for the preceding year and was 60 per cent above the 1929 total. Sulphite wood pulp represents about 85 per cent of the value of these shipments, while rags and other waste accounts for most of the remainder. Exports of sulphite increased from 68,897 long tons in 1933 to 12,348 tons last year.

◆ ◆

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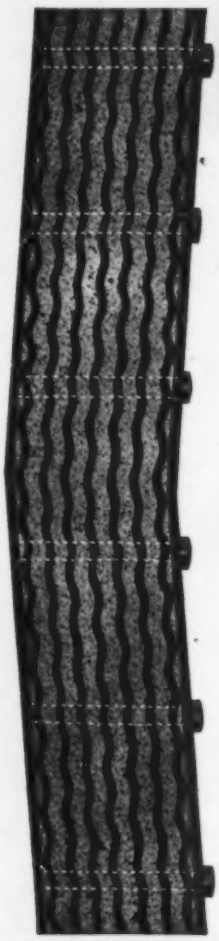

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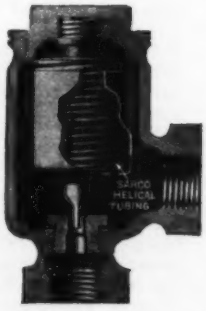

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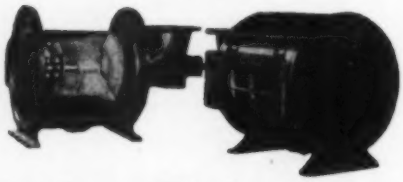

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(FROM MANAGER'S LETTER TO A FRIEND)

"I may say that we have three of these screens in use, two of them are being used to screen the stock as received from the grinders, and the other as a tail screen. We have been able to get through these screens without difficulty, from 110 to 120 tons of pulp running at a consistency of 0.6%. While we have been able to handle 110 to 120 tons of stock, we really handled this amount through two screens, using a ——— Screen, as a tail screen. Later we were so well pleased with the Trimbey Screen, that we purchased a third and discarded the ——— used as a tail screen.

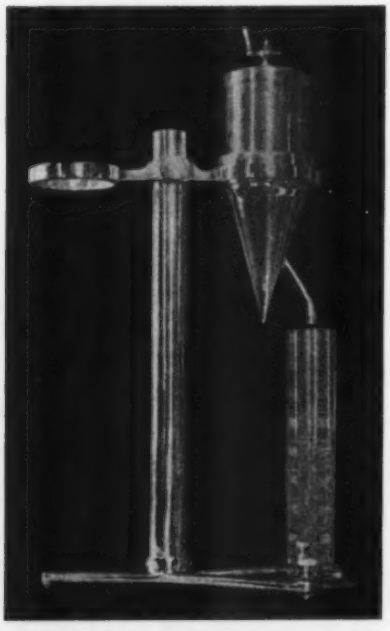
"The figures given above are normal running and screening conditions. We have a 40 h.p. motor on each screen, but our power indicators show that only 32 h.p. is used to run the screens. We have been very well satisfied with these screens, in fact, we may say that we have been astonished that a screen so small and compact would screen satisfactorily such a large quantity of stock.

"We started in using the Trimbey Screens very cautiously, buying only one. The results were so surprising and satisfactory that we immediately ordered another, and then felt that we could not do better than to purchase a third."

Yours very truly,

(Signed)_____
(Name on request) General Manager

DO YOU KNOW YOUR SLOWNESSES?



Accurately?
American Standard?
Simple?
Compact?
Portable?
Self-Contained?
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Reasonable?

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ARTHUR B. GREEN
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TISSUE FELTS made by The Waterbury Felt Company have always been outstanding for their service, long life and production.

Now we offer these same quality felts made endless in all sizes up to 100 feet long, made on the latest type, wide felt loom built.

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The TRADE MARK of GOOD FELTS

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Hygrometers
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Pusey & Jones Corp.
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Hammermill Paper Co.
Kalamazoo Veg. Parchment Co.
Mead Corporation
Menasha Products Co.

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Smith & Winchester Co.

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Hudson-Sharp Mach. Co.

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Downingtown Mfg. Co.
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Carthage Machine Co.
Duriron Co.
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Wm. Powell Co.
Sarco Company, Inc.
Trimbey Machine Works

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Wm. Powell Co.

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Downingtown Mfg. Co.
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Downingtown Mfg. Co.
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J. T. Ryerson & Son, Inc.

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Link-Belt Company

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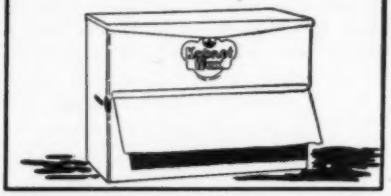
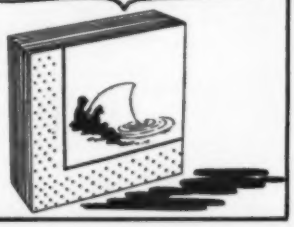


VISIBLY PACKAGED PAPER NAPKINS.. OR BULK.. PLAIN WHITE AND TINTED.. AVAILABLE TO MATCH TABLE COVERS AND PLATES!



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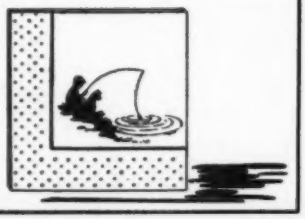

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EGG CARTONS... 3X4 AND 2X6... WITH MENASHA CUSHIONED BOTTOM-PROTECTION.. MADE OF SPECIAL NEWS LINED CHIPBOARD!

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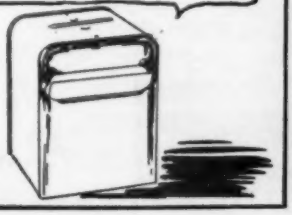

THE MENASHA PRODUCTS CO.

MENASHA, WISCONSIN

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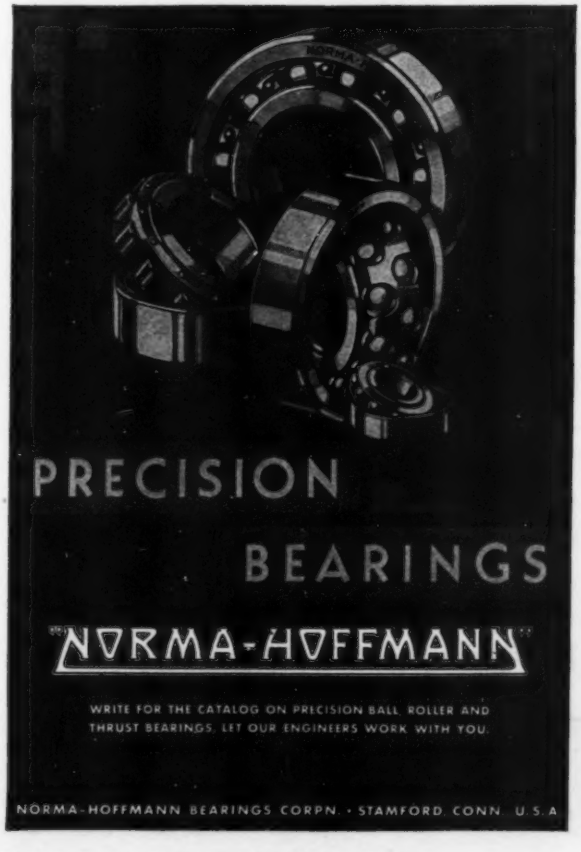
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BEARINGS
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WRITE FOR THE CATALOG ON PRECISION BALL, ROLLER AND THRUST BEARINGS. LET OUR ENGINEERS WORK WITH YOU.
NORMA-HOFFMANN BEARINGS CORPN. • STAMFORD, CONN. U.S.A.

Is a certain grade of paper opaque enough for good printing? You can determine this quickly and without calculation with the Trans-O-Meter.

Paper transmittancy is measured in one operation—just slide the sample under the Photox Cell and read the answer directly on the instrument scale.

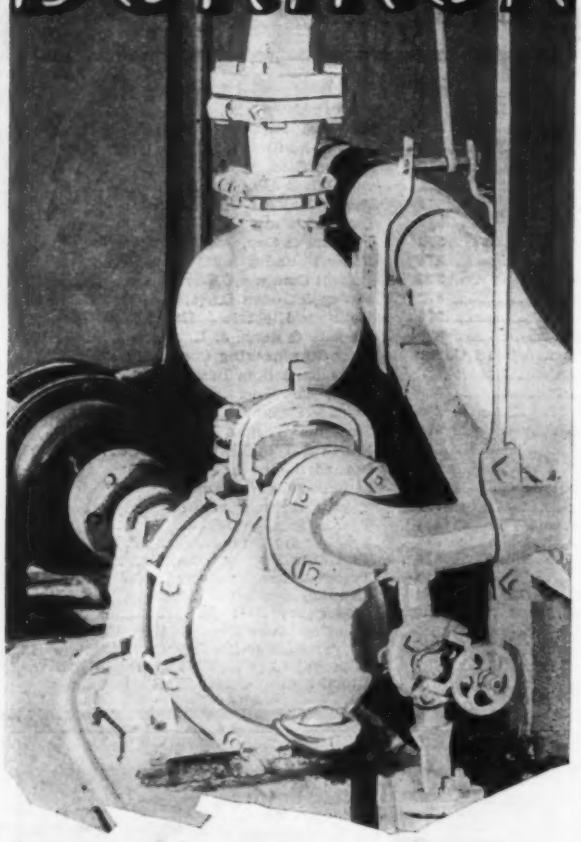
While transmittancy is the more scientific measurement, opacity is measured *directly* on the same scale.

R 57013

Westinghouse

Learn more about the Trans-O-Meter by asking for C.S. 43-770.

DURIRON



Makers of Alum Use Duriron Pumps

The Merrimac Chemical Company is using this Duriron Self-Priming Centrifugal Pump in the manufacture of aluminum sulphate (paper maker's alum).

Naturally, being chemical manufacturers, they know the reaction of their product with various metal alloys. They prefer Duriron because with it they run no risk of product contamination and also because replacement expense is held to a minimum.

You can profit by their experience. By dissolving the alum before putting it in beaters, you will have better control, produce better paper, use less alum, and, with Duriron equipment, you will cut down maintenance costs.

In making plans for remodernization, let us help you on your corrosive problems.

The DURIRON COMPANY, Inc.

Exclusive Licensees for the U. S. for the Manufacture and Sale of the Panzi Strainer

445 N. FINDLAY ST. DAYTON, OHIO

SAFETY EDUCATION

ALTHOUGH all the three "E's" of Safety (Engineering, Education, Enforcement) are important, education is a necessary part of all of them. A fair proportion of every safety educational program should be directed at the workers. Plant managers should be sure their employees are educated to be careful, to follow closely the rules of safe practices and to cooperate with their fellow workers.

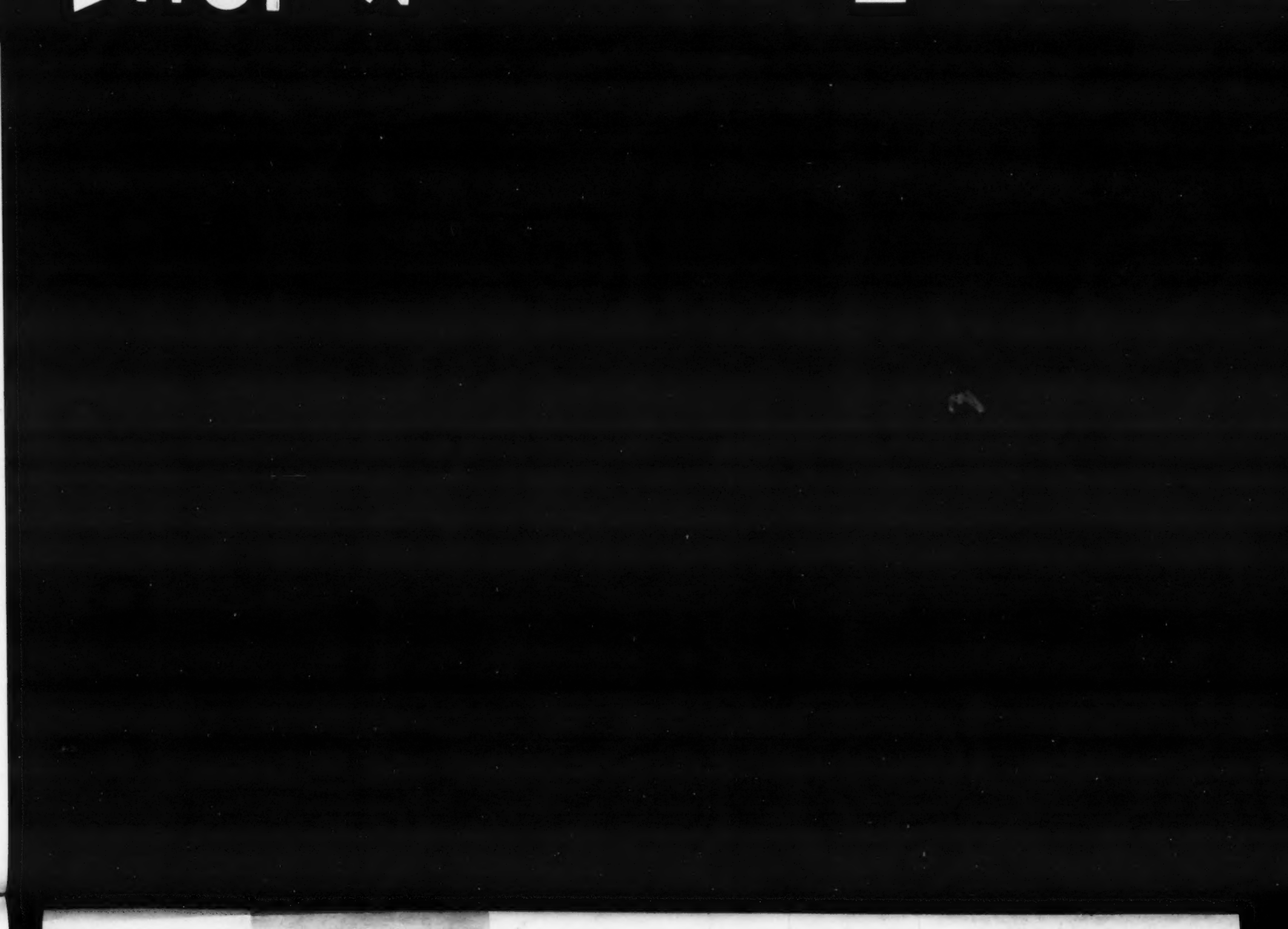
Many of the Council's services help to do this. One of these services is our monthly magazine, "The Safe Worker," a small pocket size booklet written directly to the worker. It is humorous, interesting and carries sound messages on safety and health. It is effective in helping to reduce accidents and in building up plant morale. A sample copy will be sent on request.

▼ ▼ ▼

The National Safety Council welcomes the opportunity of helping the paper and pulp industry maintain a good accident record.

We will be glad to explain our service to any firm not familiar with this important factor of industrial operation. In writing for information, please give average number of employees.

National Safety Council

(INCORPORATED NOT FOR PROFIT BUT TO PREVENT ACCIDENTS)

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